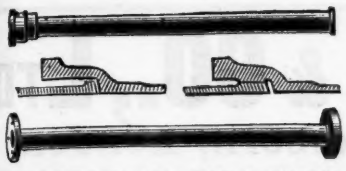
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVIII. No. 1748.] LONDON, NOVEMBER 10, 1896. [48TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,

Bonlea Foundry,

SOUTH STOCKTON-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

ALSO MANUFACTURERS OF

SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

Telegrams: "BONLEA, STOCKTON-ON-TEES."

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on Application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —

PARKER & LESTER,

Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

HOUSE'S VOLCANIC JOINTING FIRE FOR RETORTS. for STEAM, GAS, and WATER. OVER 2000 USERS. **CEMENTS**

HOUSE & CO., North Bridge Works, RIPON.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

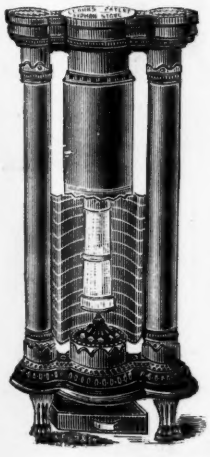
ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."



CLARK'S PATENT

"SYPHON" STOVES

FOR USE WITHOUT A FLUE.

NO FLUE REQUIRED. NO SMOKE. NO SMELL.
NO DIRT OR TROUBLE. NO DANGER.

The "SYPHON" Stove produces A PURE, EQUABLE, AND AGREEABLE HEAT, which can be graduated or sustained at the will of the user.

The most economical and convenient Heating Apparatus for all classes of Dwellings, and eminently suited for ENTRANCE HALLS, BEDROOMS, CONSERVATORIES, SHOPS, OFFICES, GALLERIES, CONCERT ROOMS, VESTRIES, &c., &c.

S. CLARK & CO.,

Patentees and Sole Makers,

SYPHON WORKS, PARK ST., ISLINGTON, LONDON, N.

Telegraphic Address: "SYPHON STOVES, LONDON."

SAWER & PURVES, Garratt St. Works, MANCHESTER,

MANUFACTURERS OF

IMPROVED WET GAS-METERS IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

IMPROVED DRY GAS-METERS.

Speciality: PATENT CASH PREPAYMENT METERS.

CATALOGUE SENT ON APPLICATION.

D. HULETT & CO., LTD.

55 & 56, High Holborn, London.

GAS SERVICE CLEANSERS.

LAMP TORCHES.

DRY GAS-METER MAKERS.

WROUGHT-IRON TUBES & FITTINGS.

STREET LAMPS & POSTS.

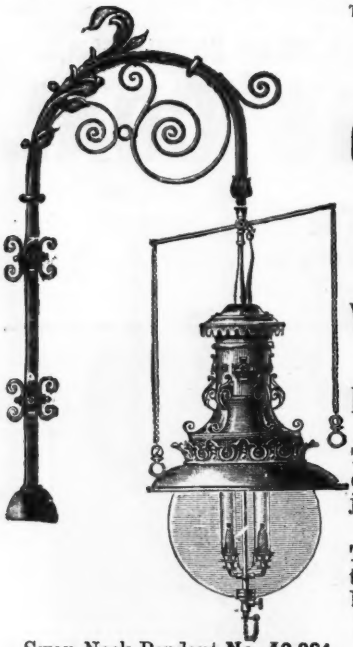
PRICE LISTS ON APPLICATION.

FALK, STADELMANN, & CO., LD.,

VERITAS LAMP WORKS,

83, 85, & 87, FARRINGDON ROAD, LONDON, E.C.

Telegraphic Address: "Lamps, London." Telephone No. 6707



Swan Neck Pendant **No. 42,281** with Lantern **No. 42,271.**

THE "VERITAS" GAS ARC LANTERNS

(PROTECTED BY ROYAL LETTERS PATENT)

SPECIALLY CONSTRUCTED FOR THE

Incandescent System of Gas Lighting.

Wind, Rain, and Dust Proof.

Enamelled Steel throughout.

Made for One, Two, Three, and Five Lights.

The undisputed great advantages of the **Incandescent System of Gas Lighting** are frequently prejudiced by atmospheric influences upon the Mantles or by sudden gusts of wind.

These deficiencies have been entirely overcome by the construction of our "VERITAS" GAS ARC LANTERN, which differs from others, and which we are confident is the best yet offered.

Each Lantern complete; nothing to get out of order; and no skill is required in fixing.

No. 42,265.

Managers of Gas Companies will do well to apply for Descriptive Catalogue GRATIS.

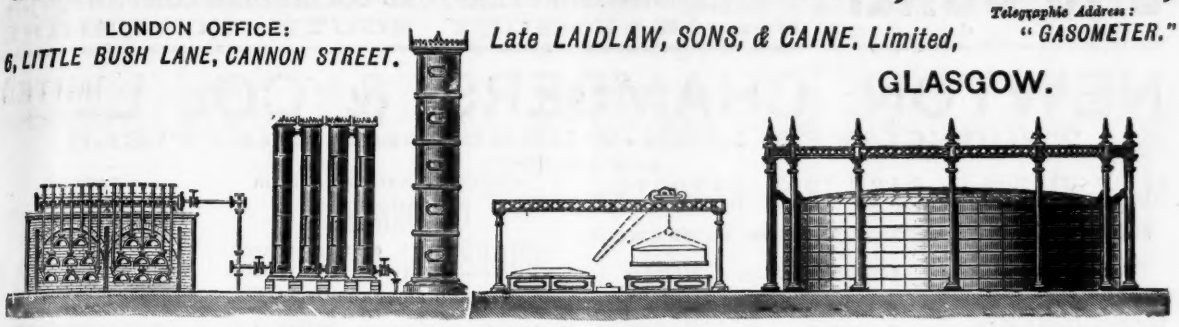
(Wholesale only.)

THE BARROWFIELD IRON-WORKS, LIMITED,

LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET.

Late LAIDLAW, SONS, & CAINE, Limited,
GLASGOW.

Telegraphic Address:
"GASOMETER."



MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS:
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT-IRON TANKS;
STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

DESCRIPTIVE SPECIFICATIONS AND ESTIMATES ON APPLICATION.

W. H. ALLEN & CO.,

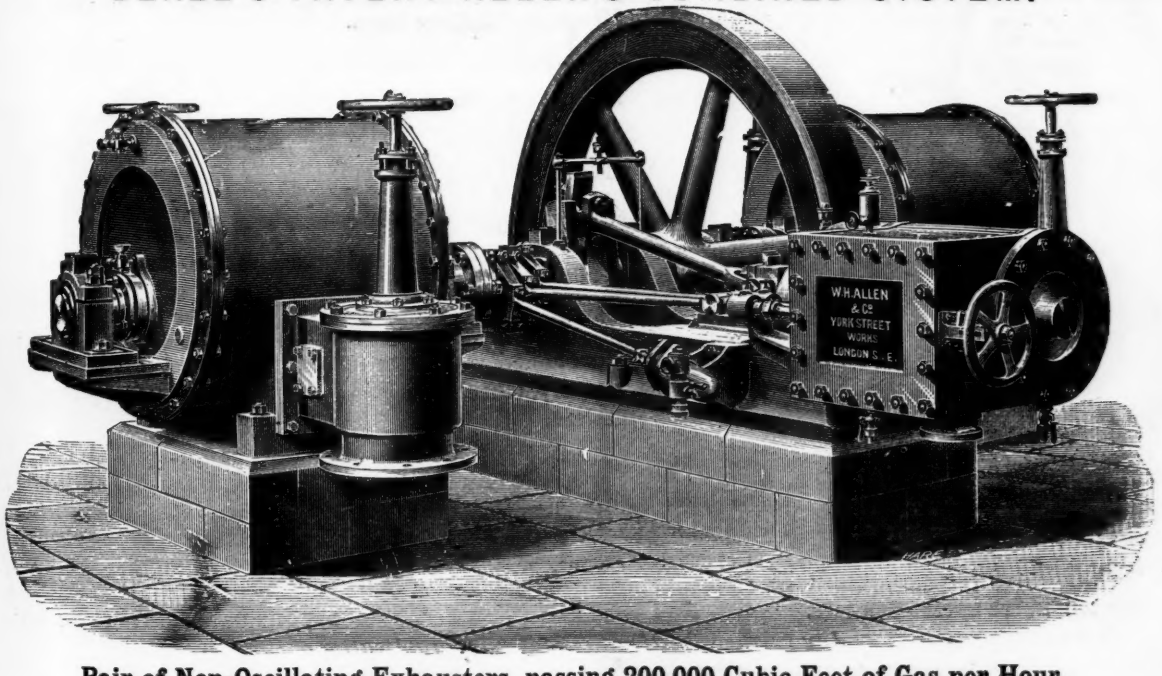
YORK STREET WORKS, LAMBETH, LONDON, S.E.,

And of QUEEN'S ENGINEERING WORKS, BEDFORD,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

GAS COAL.

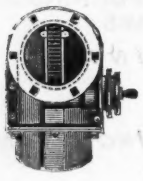
BEST
REAL OLD SILKSTONE GAS COAL,
Address THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED,

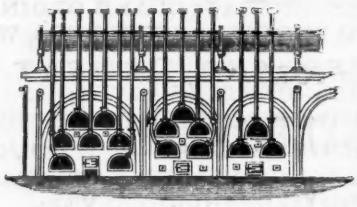
THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

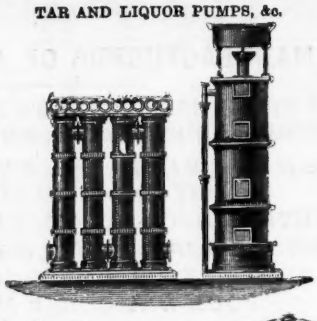
SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS of all sizes.
GASHOLDERS,
AND
Gasholder Tanks.



CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description,
Iron Roofs, Columns, Girders, Floor Plates,
Tools, &c.

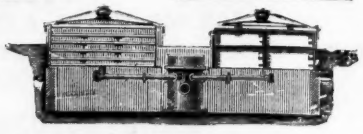


WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.



PATENT
CENTRE-VALVES
for working Purifiers,
Also Bye-Pass & Stop Valves

PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.
WOOD GRIDS.
CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

GEORGE ORME & CO.

ATLAS METER WORKS, OLDHAM.

Manufacturers of

ORME'S PATENT IMPROVED COIN METER.

We are now supplying our Wet Coin Meters in Cast-Iron and Tin-Plate Cases, both Ordinary and Compensating; also Dry Coin Meters in Tin-Plate Cases.

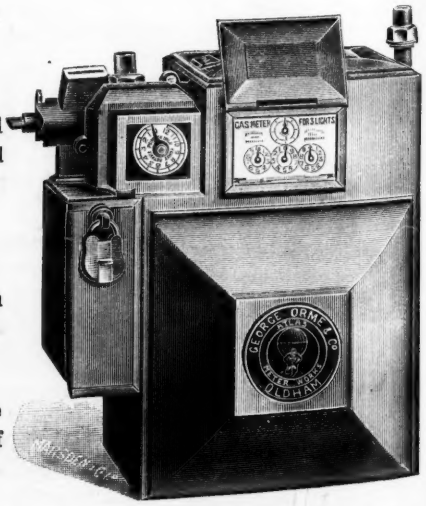
WET COIN METER IN CAST-IRON CASE.

A large number of these Meters are in use, and giving satisfaction.

The Mechanism is very simple; and there are no springs or complicated parts to get out of order.

We supply them to work with **1d., 1s., or any other Coin desired.**

The Selling Price of Gas can be changed *in Situ*, and any number of feet delivered, as may be required.



DRY COIN METER IN TIN-PLATE CASE.

Any further Particulars sent upon application.

Telegraphic Address: "ORME, OLDHAM." Telephone: No. 93, Oldham.

THE

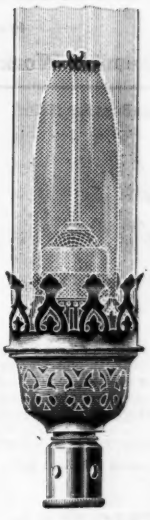
Incandescent Gas-Light Co., LIMITED.

(WELSBACH Patents.)

Pronounced by Mr. Justice Wills, and confirmed by the Court of Appeal, to be

"A PIONEER INVENTION."

FURTHER DEVELOPMENTS; ENORMOUS ECONOMY;
IMMENSE SUPERIORITY; IMPORTANT IMPROVEMENTS.

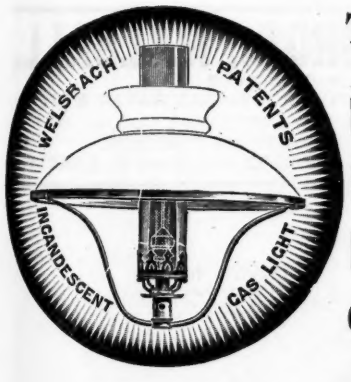


THE NEW "GEM" BURNER, 5s. 6d.
THE NEW "GEM," 5s. 6d.
THE NEW "GEM," 5s. 6d.

35-Candle Power from $1\frac{3}{4}$ Cubic Feet of Gas!!!

THE "GEM" BURNER IS SPECIALLY SUITABLE FOR DOMESTIC LIGHTING.
GREATLY IMPROVED DISTRIBUTION OF LIGHT.

It is the Brightest "Gem."
20 Candles per Cubic Foot of Gas!!!



The WELSBACH INCANDESCENT GAS-LIGHT is the

MOST ECONOMICAL
MOST BRILLIANT
MOST HEALTHY
CLEANEST GAS

} LIGHT

THE "GEM" BURNER, 5s. 6d.
THE "C" BURNER, 6s. 6d.
THE "C" BYE-PASS BURNER, 7s. 6d.

Further Particulars and Price List can be had on application to the Company's Agents or leading WHOLESALE HOUSES, or to the

INCANDESCENT GAS-LIGHT CO., Ltd.,

14, Palmer Street, Westminster.

WINTER 1896-97.

All TELESCOPIC HOLDERS should be FITTED WITH

CUTLER'S PATENT FREEZING PREVENTER

WHICH HAS BEEN FITTED TO MANY OF THE LARGEST GASHOLDERS IN LONDON AND THE PROVINCES, AND IN AUSTRIA, GERMANY, DENMARK, AND THE UNITED STATES.

Full Particulars and Prices from S. CUTLER & SONS, MILLWALL, LONDON.

Victory over Welsbach Incandescent Light.

For our first-class Burners at 10d. | WARRANTED, IN WRITING, TO
For our first-class Mantles at 5d. | VIOLATE NO OTHER PATENTS.

ALL ARTICLES FOR INCANDESCENT LIGHT GOOD & CHEAP.

Send for Price Lists.

Chemical Works: HIRSCH, JANKE, & CO., BERLIN, S.O.

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets.

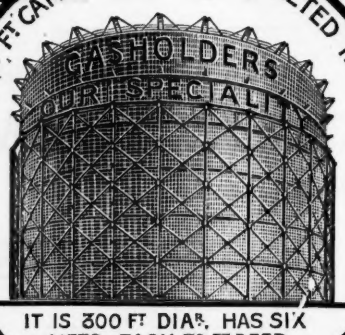
Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

Write for Price List to

THOMAS BUGDEN, Manufacturer,
71, GOSWELL ROAD, LONDON, E.C.

MAKERS OF · CLAYTON, SON & Co LTD LEEDS · ALL KINDS GAS PLANT

12,100,000 CUB FT CAPACITY. COMPLETED IN 12 MONTHS



IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.

MAKERS OF THE LARGEST GASHOLDER IN THE WORLD

HIGH CLASS BOILERS &c. ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.
Telegraphic Addresses: "GAS, LEEDS," "ECLARAGE, LONDON."

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Ltd., Short St., LAMBETH;

LONDON OFFICE
60, QUEEN VICTORIA ST. E.C.

TELEGRAPHIC ADDRESSES
"DRAKESON HALIFAX."
"ECLAIRAGE LONDON."

TELEPHONE No 43.
"HALIFAX EXCHANGE"

GAS ENGINEERS. CONTRACTORS. IRONFOUNDERS.

RETORT SETTERS. FURNACE BUILDERS. ETC. ETC.

JONAS DRAKE & SON

SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
—FOR—
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.

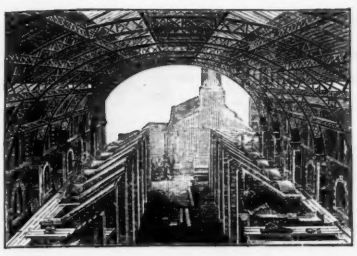
OVENDEN HALIFAX

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

W. C. HOLMES & CO.

IRONFOUNDERS AND CONTRACTORS.

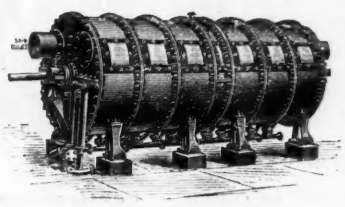


Makers of
GAS & CHEMICAL
PLANT.

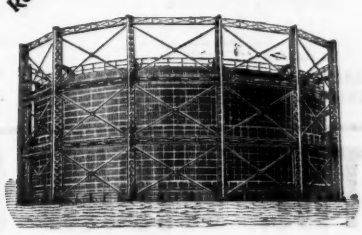
Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



GASHOLDERS of Improved Construction and of all Sizes.
ROOFS, BRIDGES, TANKS, GIRDERS.



Improved
BYE-PASS and
CENTRE-VALVES,
GOVERNORS,
and METERS.

Rotary or Pump
EXHAUSTERS.

80, CANNON STREET, LONDON,
AND
WHITESTONE IRON WORKS, HUDDERSFIELD.

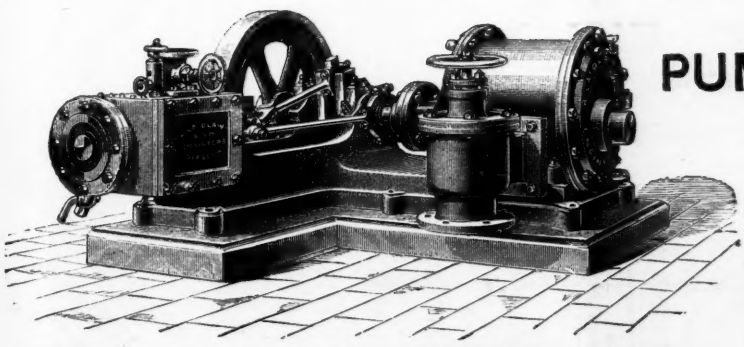
R. LAIDLAW & SON,

ENGINEERS & IRONFOUNDERS,

CAST-IRON PIPES

ALL SIZES.

MANUFACTURERS OF
STEAM-ENGINES,
EXHAUSTERS,
VALVES,
AND
PUMPING-ENGINES.



BEALE'S GAS EXHAUSTER AND ENGINE COMBINED. ALL SIZES.

ALL KINDS OF
GAS AND WATER
APPARATUS.

ALLIANCE FOUNDRY,
GLASGOW.

SIMON SQUARE WORKS,
EDINBURGH.

6, LITTLE BUSH LANE,
LONDON, E.C.

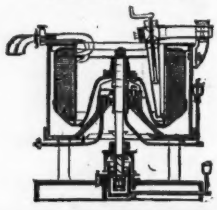
KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

MARSHALL'S PATENT COMBINED BATTERY CONDENSER AND SCRUBBER.

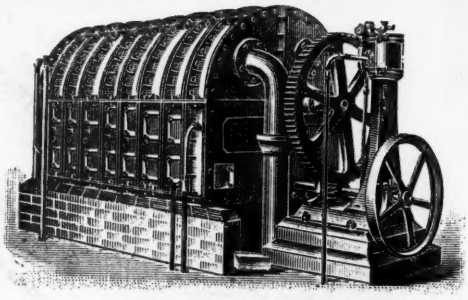
Extract from letter from Mr. Winstanley, of Coventry: 'The Condensers you erected for us have been in use some time, and are working very satisfactorily.'

BURMEISTER AND WAIN'S TAR-SEPARATOR.



EXTRACTS OVER 90 PER CENT. OF AMMONIACAL LIQUOR FROM TAR.

PATENT "STANDARD" WASHER-SCRUBBER.

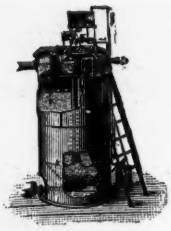


OVER **530** MACHINES

In use and in course of Construction.

They extract all the Ammonia and a large proportion of Carbonic Acid and Sulphuretted Hydrogen.

BRUUN'S PATENT WATER SOFTENER



PREVENTS ALL "SCALE" AND SAVES FUEL.

MARSHALL'S PATENT TAR EXTRACTOR AND WASHER.

Extract from letter from the Late Mr. Jabez Church: "The Marshall Patent Tar-Extractor has given very satisfactory results."

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland District Office: PRINCE'S CHAMBERS, 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

TELEGRAPHIC ADDRESS: "PARKER LONDON."

W. J. JENKINS & CO.

GAS ENGINEERS AND IRONFOUNDERS,

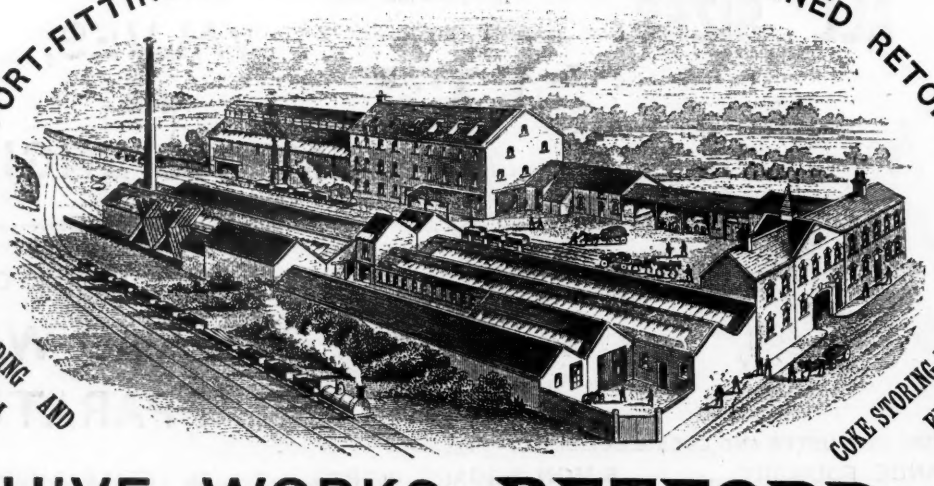
MAKERS OF ALL KINDS OF

PLANT AND MACHINERY FOR GAS-WORKS.

COAL-BREAKERS. COKE-SCREENS.

MOUTHPIECES. LIQUOR-TANKS.

RETORT-FITTINGS, REGENERATOR SETTINGS, INCLINED RETORTS.



COAL UNLOADING AND CONVEYING A SPECIALITY.

COKE STORING PLANT, ENGINES, EXHAUSTERS, VALVES.

BEEHIVE WORKS, **RETFORD,** NOTTS.

CARBURETED WATER-GAS APPARATUS

MERRIFIELD—WESTCOTT—PEARSON PATENTS.

THE

ECONOMICAL GAS APPARATUS CONSTRUCTION Co., Ld.

W. H. PEARSON, President.
W. H. PEARSON, Junr., Vice-President.
J. T. WESTCOTT, M.E., Manr. & Treas.
L. L. MERRIFIELD, M.I.M.E., Chief Engineer.

London Offices: SUFFOLK HOUSE, LAURENCE POUNTNEY HILL, E.C.
American Offices: TORONTO.

TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

Carbureted Water-Gas Engineers.

The above Company have erected during the last three-and-a-half years, or are now erecting, their

UNIVERSAL TYPE of CARBURETED WATER-GAS PLANTS

AT THE FOLLOWING GAS-WORKS:

AMERICA.

TORONTO	One New Set, and Four Double Superheater Settings improved.
MONTREAL	Two New Sets, and other parts of Plant.
OTTAWA	Two New Sets.
BELLEVILLE	One "Springer" Setting Remodelled with "M-W-P" Patents.
PETERBOROUGH	One Set and Remodelled Works.
LINDSAY	Remodelled Plant.
BRANTFORD	Added Improvements to existing Setting.
ST. CATHERINES	do. do.
KINGSTON, U.S.A.	One New Set, and other parts of Works, including New Purifiers and Gasholder.
WILKESBARRE, U.S.A.	Two New Sets, and other parts of Plant.

ENGLAND.

		Daily Capacity in Cubic Feet.
BLACKBURN	Two New Sets	1,250,000
COLCHESTER	One New Set	300,000
BIRMINGHAM	Four New Sets	5,000,000
BIRKENHEAD	Three New Sets	2,250,000
SWINDON	One New Set (New Swindon Gas Company)	125,000

N.B.—The **M.-W.-P.** Plant is built under penalty to Manufacture Gas on less Raw Material than any other Plant on the Market.

All Enquiries to be Addressed to the Company's Offices.

We have Completed for the BIRMINGHAM CORPORATION

THE

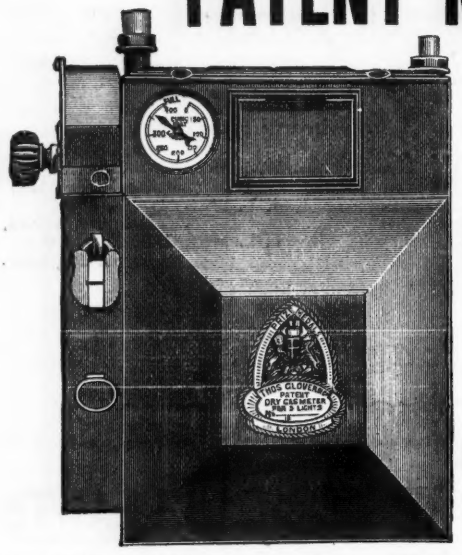
LARGEST SINGLE ORDER

EVER GIVEN IN GREAT BRITAIN FOR

CARBURETED WATER-GAS PLANT.

THOMAS GLOVER & CO.'S

PATENT NEW IMPROVED



PREPAYMENT METER

For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

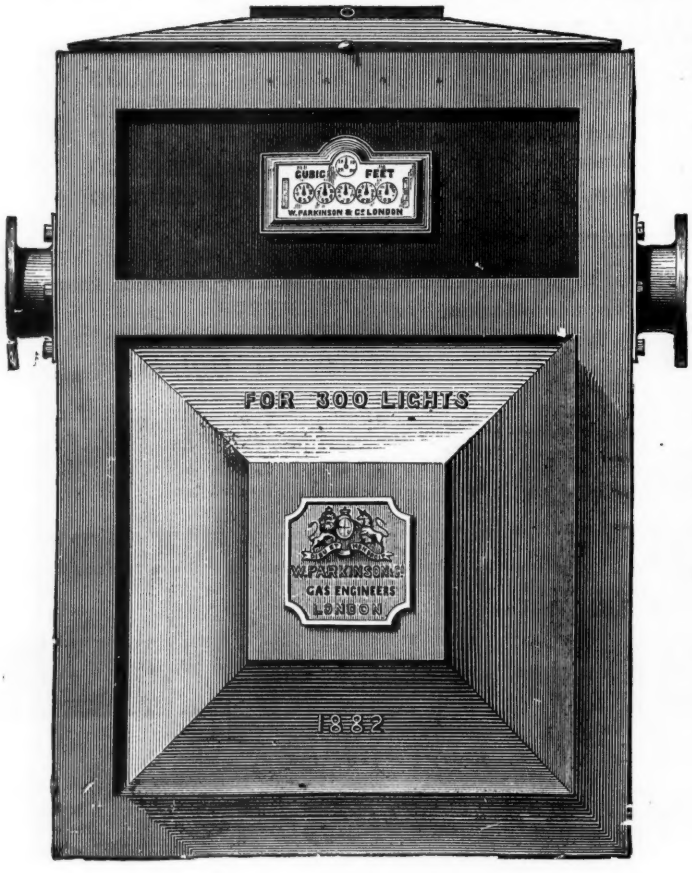
214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

W. PARKINSON & Co.



MANUFACTURERS OF

DRY METERS

OF THE VERY BEST QUALITY.

The DIAPHRAGMS are of the Finest PERSIAN SHEEP SKINS.

The CASES are of the Best CHARCOAL-TINNED PLATES.

WET METERS,

With PATENT THREE-PARTITION DRUMS.

STATION METERS AND GOVERNORS,
PRESSURE & EXHAUST REGISTERS,
MOTIVE POWER METERS,
Test Gasholders, Experimental Apparatus, &c.
PRESSURE-GAUGES OF EVERY DESCRIPTION.

NEW ILLUSTRATED CATALOGUE AND PRICE LIST
Sent post free on application.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS METERS."

CONTENTS.

EDITORIAL NOTES:— PAGE

GAS, LIGHTING, &c.—
The Affairs of the Imperial Continental Gas Association . . . 895
The Triumph of Gold—or Mammon? 895
Cheap Gas for Belfast 896
Parliamentary Prospects 896
A Belgian View of the British Workman's Sunday 897

WATER AND SANITARY AFFAIRS—
The Metropolitan Water Question—
The Suggested Transfer of the Water Undertakings 897
The Quality of the Water 898

ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market 898
Electric Lighting Memoranda. 898
A Retrospect of Victorian Engineering 899

NOTES:—
The Problem of Mechanical Road Traction 901
Argon in Coal 901
The Treatment of "Gassed" Subjects 901
A New Safety Apparatus for Miners. 901
A Sanitary House 901

TECHNICAL RECORD:—
American Gaslight Association—Papers at the Annual Meeting at St. Louis (Mo.)—
A Modern Retort-House. By W. A. Miller, of Cincinnati . . 902
Inclined Retorts up to Date. By F. Egner, of Norfolk (Va.) . . 904
Fletcher, Russell, and Co.'s Improvements in Gas Heating Appliances 907

REGISTER OF PATENTS:—
Prepayment Fluid Meters—Webber, W. 907
Gas-Burners—Gearing, E.. 908
Gas-Regulators—Tobler, A. C. 908
Producing Acetylene Gas—Trouvé, G. 908
Keeping Gas-Engine Cylinders from Becoming Hot—Lewis, J. . 908
Gas Traction Cars—Holt, H. P. 908
Generating Acetylene Gas—Clarke, W. C. 908
Extracting Tar from Illuminating Gas—Knapp, I. N. 909
Water-Meters—Lux, F. 909
Regulating the Admission of Gas to Incandescent Burners—Göbel, R. 909
Gas-Fires—M'Caig, W.. 909
Lighting and Extinguishing Gas-Lamps—King, J. T. (The Connelly-Critchlow Company) 910
Patent Notices 910

CORRESPONDENCE:—
The Permanency of Illuminating Gas 910

LEGAL INTELLIGENCE:—
High Court of Justice—Chancery Division—
Jervis *v.* Newcastle and Gateshead Water Company 911
In re the Hoylake and West Kirby Gas and Water Company, Limited 911
Bromley County Court—Kirby *v.* Bromley Gas Company; An Important Point of Procedure 912
Claim for Disturbance in Laying Water-Pipes. 912

MISCELLANEOUS:—
Meeting of the Imperial Continental Gas Association 912
Meeting of the Colonial Gas Association, Limited 913
The Gas Supply of Vienna—The Projected Municipal Gas Undertaking 914
Meeting of the Oil-Gas Enrichment Company, Limited. . . . 914
Gas Lighting and Heating Appliances at the Brewers' Exhibition 915
The Dunfermline Gas-Works Arbitration 915
Belfast Corporation Gas Supply—Reductions in Price *v.* Large Profits and City Improvements 919
Extensions at the Leeds Corporation Gas-Works—A Large Inclined Retort Installation 920
Huddersfield Corporation Gas Supply—The Past Year's Working; The Progress and Present Position of the Undertaking . . . 920
Electric Lighting Notes 921
Acetylene as an Explosive. 923
Metropolis Water Supply—The London County Council and the Examination of Water 923
Proposed Purchase of the Harrogate Water-Works by the Corporation—Parliamentary Powers to be Applied for 924
Meeting of the Cape Town District Water-Works Company . . 924
Notes from Scotland. 925
Current Sales of Gas Products 925
Coal Trade Reports 926
Gas and Water Companies' Stock and Share List 926

PARAGRAPHS:—
PERSONAL: Mr. A. J. Kingdon; Mr. W. W. Woodruff; Donation; Dr. Wallis; Dr. W. Pole, F.R.S., and Mr. James Forrest. . . 900
Society of Arts 899
Gas-Engines and Electric Lighting—Southern District Association of Gas Engineers and Managers—Papers for the Institution of Civil Engineers 900
Mr. Thomas Glover's Coal-Testing Plant—The Rainfall in September—An Improved Street-Lamp—Frangibility of Glass Chimneys 901
New Water-Works for Larne 914
Gas and Electric Lighting in the Manchester Out-Districts—The Price of Gas at Cranbrook 915
Outside Authorities and the Wakefield Water Supply—Gas and Water Profits at Salford. 920
Heanor Water Supply Scheme—Retford Corporation Gas and Water Undertakings—Quality of the Gas Supply of Lichfield . 922
Reductions in Price—Improvements at the Brighouse Gas-Works—Proposed Municipalization of the Lowestoft Gas and Water Works—Disproportionate Charges for Public Lighting—Sales of Shares—Popular Lecture on Gas and its Capabilities . . . 926
The Proposed Kent Water Board—The Gas-Works Purchase Question at St. Annes—The Supply of Water in the Dover District—The Freezing of Water-Mains in the Metropolis—The Torrington Corporation and the Water-Works—Maidstone Water-Works Purchase Question 927
The Proposed Purchase of the Fylde Water-Works by the Local Authorities—The Proposed Extension of the Blackpool Gas Supply Area—Winding Up of the Shoreham Water Company—The Position of the Bay State Gas Company—Lighting of Crowland—Extensions at the Guildford Gas-Works—Public Lighting by Incandescent Gas-Burners at Darwen—Mr. W. Whatmough on the Economic Use of Gas 928
London County Council and Street Subways—Draycott Gas Company 929

EDITORIAL NOTES.

The Affairs of the Imperial Continental Gas Association.

EXCEPTIONAL interest attaches to the report published in another column as to the proceedings at the half-yearly ordinary general meeting of the Imperial Continental Gas Association, held on Tuesday last under the presidency of Mr. T. H. Goodwin Newton, the Chairman of the Association. The working of the different undertakings belonging to the organization during the past half year does not exhibit any remarkable features; and it is not in anything connected with, or arising out of, the ordinary operations of the Association that the interest of our report centres. As the Chairman observed in his address to the proprietors, these matters constitute the chief, and usually the sole, cares of the directorate of an English Gas Company; but the heavier duties and responsibilities of the administrators of the Imperial Continental Gas Association only begin at this point.

Some very disturbing reports have been published lately in the English newspapers respecting the prospects of the Vienna undertaking of the Association; and it has been asserted that, rather than buy this property at a fair valuation on the approaching termination of the concession, or even renew the contract, the Municipality of the Austrian capital intend to build works of their own. The immediate effect of these statements has been to depreciate the value of the stock of the Association; and this movement would doubtless have gone farther than it has but for the confidence felt by the proprietors in the wisdom and resources of their experienced directorate. Naturally, however, the Chairman's speech at the meeting was awaited with intense curiosity, if not with anxiety, for authentic information respecting the condition of affairs. This speech we are able to characterize as a most statesmanlike and candid presentment of the case. It admits that a party craze for municipalization has so far carried away the majority of the present Town Council of Vienna that a resolution to build town gas-works has actually been adopted by this body. As to what the Association will be able to do in face of the situation thus created, the Chairman very properly refrained from saying anything; and he begged the proprietors to exercise the same restraint upon themselves. He reminded the meeting that the threatened trouble is not by any means the first of the kind that the Association has had to meet, and has passed through without suffering loss. This preservation has been largely due to the fact of the Directors having always enjoyed the fullest confidence of the proprietary, who have been content to leave them to frame and carry out their policy without insisting on embarrassing preliminary explanations. There is nothing else to be done now.

Mr. Newton permitted himself to indicate that the Board have more than one policy for dealing with the Vienna case; and, with this assurance, outside curiosity, however natural and in a way excusable, must rest content. If the worst comes to the worst, it is in the remotest degree unlikely that anything their friends and supporters among the proprietary might publicly suggest or do at the present juncture would have helped to avert the mischief. It is a long way from the passing of a resolution by the Vienna Town Council to the erection of superfluous gas-works at enormous cost; and, apart altogether from the question of the claim of the Imperial Continental Board to the implicit confidence of the proprietors whom they have hitherto served so well, time must be given for the quiet development of those considerations of justice and expediency which will be all on the side of the Association. The strength of the Association lies in these considerations, and not in fussy protests or artful schemes. We also publish, in reference to this business, translations of two extracts from Viennese journals that go to prove the weakness of the municipal case—which is not what at least one of the writers intended. It is unnecessary now to discuss the matter at greater length; but further developments will be awaited with lively interest.

The Triumph of Gold—or Mammon?

AN unusual amount of interest was taken both at home and abroad in the issue of the contest between Major M'Kinley and Mr. Bryan for the presidentship of the United States; and the election of the former by a large

majority last Tuesday has been everywhere hailed as constituting a victory of national honesty over the temptations offered by a monstrous alliance of Free Silverites, Socialists, Anarchists, and other parties of adventure. We will hope that this is the correct view of the situation. Major M'Kinley is best known on this side of the Atlantic as the sponsor of the ultra-Protectionist tariff which was to enrich the American working man at the expense of the wretched and effete manufacturing nations of Europe, and did in effect help American manufacturers to attain that commanding position which is now thought to be not altogether to the advantage of the rest of the community. In his capacity of working American politician, therefore, Major M'Kinley has not commended himself to the kind sympathies of foreigners; while the value to his native land of his services in the same capacity is, to say the least, problematical. It is a curious proof of the gravity of the issues raised in this presidential contest that the triumph of this hard-and-fast Protectionist should have been received in England with so much satisfaction; whereas at the date of President Cleveland's election, M'Kinleyism was regarded as an expression of American intolerance of international trade and intercourse that did not work all one way. Several things have happened since that period. It would take too long to inquire how Major M'Kinley came to represent the cause of honest money and other creditable aspirations of the American national conscience. Like the traditional Scotch moralist, he may be allowed to know that honesty (in regard to currency) is the best policy, for he has "tried baith," only to learn that the white metal is not good enough to win the White House upon. It is by no means easy to understand the merits of his opponent's case. It was popularly supposed to stand upon the fundamental principle that silver should be made a legal tender to any amount; but how this was going to benefit anybody except a few Silver Kings did not appear on the surface. Currency questions are, however, things which statesmen only should deal with; and the peculiar hazard of the election that has just concluded was that the most important of all such questions was tossed by demagogues to the mass of electors to settle. Hence it really is a cause for international thankfulness that a great democracy, with its financial future to make or mar by a single vote, has proved equal to the emergency, and has declined to be led away by the modern Jack Cades who promised to make fifty cents into a dollar.

The decision is the more remarkable, inasmuch as, apart from the puzzle of the subject-matter, the organizers and paymasters of the cause of sound money were those notorious industrial and railway monopolists who are suspected of holding all America as a plutocracy. It is observed, however, by the correspondent of "The Times" in the United States, that "the causing cause of Bryanism was "the rapacity of the silver-mine owners. . . . . One "of the causes which contributed to the spread of this "delusion was the hatred of honest men to the system "of so-called 'trusts'—another name for the combined "monopolies which oppress this people, and plunder their "substance by means which are probably illegal and cer-"tainly immoral. But the most gigantic trust of all is the "Silver Trust; the closest combination is the combination "of silver miners, whether individuals or States; the most "cruel monopoly is that of silver monometallism." The Anarchists, the Socialists, the charlatans of all varieties who took their chance with Bryan were not much more despised and disliked by the better sort of American electors than the oil and railway kings, the steel and whisky monopolists, who ranged themselves behind M'Kinley, and supplied him with funds for his campaign. To a very considerable degree it is the same treatment and dietary which has produced both kinds of monstrous growth on the body politic of the United States. The tariff fosters the "trust;" and the monopoly creates the rebel. The last presidential contest has exhibited on both sides the meeting of extremes. The Silver Kings joined hands with the Henry Georges, while the Chauncey Depews and the Rockefellers made common cause with the consumers of the necessaries of life who are taxed to maintain them and their private interests. It was an odd jumble, and it would not be surprising if after a time the mechanical mixtures were to separate once more into their elements. Meanwhile, the United States are to have an honest dollar, which is the first necessary of the national working life. There is a familiar locution which tells of the American "chase after the Almighty Dollar;" and those who are engaged in this engrossing pursuit are to be congratulated on having secured a dollar of the usual value to run after, instead of the simulacrum offered to them by Bryan. If it should appear, however, that an undue number of these respectable representatives of the national honesty are being diverted, by unjust laws and a vicious commercial system, into the pockets of M'Kinley's campaign paymasters, there will be trouble.

Cheaper Gas for Belfast.

THE reputation of the Corporation of Belfast for practical wisdom was once more justified at their last quarterly meeting, when the recommendation of the Gas Committee to reduce the price of gas by 3d. per 1000 cubic feet was carried against an amendment that the amount represented by the reduction should be applied in aid of the city improvement fund. In Belfast there is a system of differential rates for gas, under which a standard price of 2s. 6d. per 1000 cubic feet becomes an actual charge of about 1s. 10½d. or 1s. 11d. to the largest consumers. A good deal of dissatisfaction with this arrangement exists in the Corporation and among the general body of gas consumers; but it is excused as being a legacy of the old Gas Company, and there are difficulties in the way of making the price uniform. However this may be, the fact that the largest consumers of gas are to get a considerable benefit from the reduction was used as an argument against the proposal by one or two members of the Town Council, who were at the time under the impression that, in the event of the reduction being made, the consumers who have the biggest discount would get their gas under cost price. This is not the case, as the Town Clerk was able to show on the authority of Mr. Stelfox; and so the most serious objection to the reduction failed. The plea for a subsidy for the making of city improvements was supported by Alderman Sir J. H. Haslett in a very fair manner; but he could not deny that, in cheapening the gas supply, the Corporation would be conducing to the prosperity of local trade and the welfare of the city. Nearly every one of the other speakers to the motion confessed that more good would be effected in this way than by apparently relieving the improvement rate by a subsidy of equal amount. Our report of the discussion, which appears in another column, is to be commended to the attention of all members of local authorities situated similarly to that of Belfast in respect to gas supply.

Parliamentary Prospects.

THE time for the publication of parliamentary notices for next session has nearly arrived, and within a few days all who are interested in the statutory gas undertakings of the United Kingdom will be in possession of positive information as to the extent and scope of the proposed Private Bill Legislation for 1897. We have already heard of several small Provincial Gas Bills to be promoted for the usual purposes; the growth of the gas industry throughout the country being happily as rapid as ever. There is as yet no news of any important schemes for the transfer of gas undertakings from private to municipal ownership. It is unlikely that the Corporation of Liverpool will be ready just yet to take any parliamentary action upon the recommendations of the Lighting Committee already noticed in these columns; and when such action is set going, it will be directed to the objects of control and re-settlement, not to that of purchase. It has been more than suspected that at least one Metropolitan Gas Company would go to Parliament next session; but if there is any such intention on the part of the authorities concerned, their secret has been well kept, and their policy is not known outside their own advisers. It is possible that more than one gas company may apply for electric lighting powers, to enable them to supply electric light under special conditions, as well as to remove the disability under which some gas undertakings labour in regard to the establishment of gas-engine power stations. We understand that the expediency of this latter proceeding has engaged the attention of several gas managers; and it is a fact that a good many gas companies remain without statutory power to supply, or to encourage the use of, any description of gas-consuming apparatus, to say nothing about engines. It would rarely be worth while to proceed by Bill to obtain facilities of this kind; but the capabilities of Provisional Orders are sufficient to meet the case.

A Belgian View of the British Workman's Sunday.

A RATHER curious paragraph appeared in a recent issue of "The Times," entitled "A Belgian View of the English "Sunday." It was to the effect that, with a view to the legal establishment of Sunday observance in Belgium, the Government commissioned a M. Vercruysse, described as a Doctor of Laws, to collect information concerning the English practice in this regard as viewed from the legal and industrial standpoint. There have been many Continental witnesses of the English Sunday; and the tenor of most of their testimony is sufficiently familiar. But it is something novel to see this insular institution judged by a lawyer with a brief for Labour. M. Vercruysse speaks of the English Sunday precisely as one would expect a traveller in remote lands to discuss an odd custom of the aborigines. He is greatly struck with the fact that Englishmen observe their Sunday, not because they are legally compelled to do so, but from custom and by "the free action of those "whom it most concerns." He dismisses the religious aspect of the observance with the remark that this "tends "to disappear;" and he concludes that it is chiefly, and will increasingly be, an economic question. "Six days "or seven days work a week," he says, "mean nothing, "in the eyes of the Trade Unions, but a question of more "or less wages. In general, and like all work for which "there is little demand, Sunday labour is better paid than "weekday work. Nothing more is required of the em"ployer than that he should pay the workman for the "sacrifice of his scruples. But as, on the whole, the re"pugnance of the working class against Sunday labour is "profound, and as the working man is strong enough to "make his own terms, the master, on his side, has no "desire to pay a fancy price for Sunday work, and there"fore only resorts to it in cases of extreme necessity. "Thus we find realized without legal pressure, and "thanks to the powerful organization which assures to "individuals the exercise of their theoretical liberty, the "ideal formula of dominical repose, superior by its elasti"city to the most elaborately drawn-up laws." The meaning of the last sentence is not clear; but it is the less necessary to puzzle it out because the whole passage is a grotesque misrepresentation of the truth of the matter. The author concludes that the British workman is growing tired of his Sunday because he can find more amusement on the Monday! He says that a petition in this sense has already been addressed to various masters by their hands, who often leave work to attend the great football matches, which, he thinks, are invariably played on Mondays. The refusal of the masters he attributes to a fear of running counter to public opinion; but he thinks the attractions of football and the inconvenience of being short of hands on Mondays will eventually triumph over their scruples. One would like to see one of those petitions of working men for the abolition of Sunday rest, which the employers would so gladly grant were it not for their fear of public opinion. M. Vercruysse has written a book on the subject; and we should like to have a copy of it for review, and in order to see whether the Sunday rest of gas stokers has been brought under his notice. It would be a curious inquiry as to how and why the idea of Sunday observance came to be so strange to a Belgian gentleman that he is absolutely incapable of understanding the institution after having seen it. Some of his remarks seem to imply that he thinks it a creation of Trade Unionism; but he can hardly be so far astray as this. At any rate, it is to be hoped the Belgians will recover their Sunday. But if a new law is needed to bring this about, the Belgian Government will find much more precise information on the point in Germany than can be supplied from England.

WATER AND SANITARY AFFAIRS.

DURING the past week, rumours have been rife as to negotiations between the Progressives and Moderates of the London County Council, for the purpose of agreeing to a Water Bill to be promoted in the next session of Parliament. The main principle to be embodied in such a Bill is that of purchase as applied to the undertakings of the London Water Companies, the transaction to be promoted by the Council. Some months ago, the Council adopted a resolution that they would introduce a Bill next year to effect this purpose. But about this central idea various considerations have to be grouped, concerning which it is exceedingly difficult to obtain a general consent. One great obstacle to a settlement of terms consists in a want of cohesion on the Moderate side. The Earl of Onslow and Mr. Stuart may draft the heads of an agreement to which the Progressives will subscribe; but the Earl has found it next to impossible to secure the loyalty of the Moderates as a body. The latter are even found to have rejected an agreement which the Progressives have accepted; and Lord Onslow is described as being thereby driven, together with his more faithful followers, into an attitude of antagonism to any scheme likely to be brought forward. Concessions made in order that the question might be settled are thus withdrawn; and unless a better understanding is quickly arrived at, the ensuing session will most assuredly be lost. The resistance offered by the Moderates has—at least for the time—destroyed the prospect of that united action without which a Water Bill promoted by the Council would fail to command the respect of the Government. Sir John Lubbock, and other members of the Moderate party, are not disposed to give up their preference for a system of control; and though this is not the sole difficulty in the way, it is one of some magnitude. The agreement which the Moderates have now refused to endorse provided that the Council should acquire the water undertakings by agreement, or, failing that, by compulsory powers "on arbitration terms." But the arbitration clause was to specify that no allowance should be made for compulsory sale, except so far as the arbitrators might award to meet the cost of re-investment. For the settlement of questions relative to the outer areas, it was proposed that a Special Commission should be appointed to inquire into the whole subject, with power to prepare a scheme or schemes for submission to Parliament. The phrase "severance of sources" which appeared in this part of the agreement, showed that the contemplated plan would separate the outer areas of supply from the central part. For the constitution of the Special Commission, the agreement contained a proposal that the requisite provision should be made in the coming session. The Special Commission looks very like a shadow of the Water Board. Mr. Henry Clarke, in a letter to "The "Times" last week, favoured the idea of a revival of the Water Board Bill, subject to "a few alterations." He argues that every attempt at legislation respecting the purchase of the undertakings has been overweighted by seeking to adjust difficulties "which might better be re"served for the consideration of the new Board." Some intermediate stage seems almost inevitable.

In a report which comes before the County Council to-day, the Parliamentary Committee recite the heads of the abortive agreement, and express their great regret that they had not been able to come to a unanimous conclusion in support of it. They now propose that a Bill or Bills for the purchase of the water undertakings should be at once prepared; and, so as to save time, they have already given instructions to the Council's Parliamentary Agent for this purpose. The proposed provisions agree with those of the previous agreement, until the scheme comes to the question of the authorities. On this point it is specified that the Bill or Bills shall be so drafted as to provide that the Council, acting in conjunction with the Corporation of the City, shall be the authority for supplying water within the area of the county. Beyond this limit, the Local Authorities are to be empowered to take over and administer the entire water supply of their districts, upon such terms as to severance of sources "or joint "management" as may be agreed upon, or as may be settled by arbitration. In the terms of purchase, it is provided that there shall be no compensation for compulsory sale; and the Council are to take power to agree with the Companies or any of the shareholders that the purchase-money, when ascertained, may be paid in the form of terminable annuities or otherwise. On this report, the Earl of Onslow has given notice of an amendment, to be seconded by Mr. Beachcroft, that the report be referred back to the Parliamentary Committee for certain alterations; and further that Her Majesty's Government be requested to introduce a Bill constituting an authority for the purpose of dealing with the supply of water to the area now supplied by the Water Companies, "and pending the

"final settlement of questions between London and the "outside areas." It is also proposed by this amendment that the Government be asked to appoint a Special Commission to hold an inquiry as to the relation between London and the outside areas, including the question as to severance of sources and works. Lord Monkswell has given notice of an amendment which would give effect to the rejected compromise.

The opponents of the London Water Companies are making the most of the microbe. They multiply and magnify him to the utmost. The "British Medical Journal" declares his presence in the Metropolitan Water Supply to be such that, unless the supply is discontinued, one out of every twenty-five inhabitants of London will be involved in serious illness "at some time in his life." We think it not at all unlikely that this would happen, even if the microbe were absent. The "Daily Chronicle" is delighted with this "grave scientific indictment," and brings it into prominence in its leading columns—"not for the purpose "of creating a scare," but, with admirable diplomacy, "because the question of water purchase is passing at "this moment through an acute crisis." The "St. James's "Gazette" takes a philosophical view of the subject, and expresses the idea that bacterial science is at present "quite in its infancy;" the state of the case being that "bacteriologists are all more or less groping in the dark" —entertaining themselves with that which is "only a "tentative and imperfect method of investigation." Dr. Klein flourishes a two-edged sword; for he declares that while the presence of a large number of microbes may indicate considerable pollution, the presence of only a small number does not indicate the absence or removal of such pollution. One way or the other, the water seems pretty sure to be wrong; thus justifying a remark by the "St. James's Gazette," that it is highly probable no water in the world, as delivered to consumers, would show much better results than the London supply, "if "subjected to the same severe and novel tests." A very striking instance on this point consists in the discovery of an extraordinary number of bacteria in water derived from the deep chalk wells of the Kent Company. Testing this water, Dr. Klein found it to contain from 124 to more than 20,000 microbes per cubic centimetre. In 1891-2, even Mr. Dibdin found an average of 4795 microbes per cubic centimetre in the Kent water. How could such a multitude find their way into the immaculate water of the Kent wells? Of course they were not found in the wells, but in the stand-pipes; and in this fact we may find the chief solution of the mystery. The Welsh water has few microbes on the spot; but who shall say how many it would have by the time that it was delivered from a stand-pipe in the Tottenham Court Road, or elsewhere in London? The prodigious fecundity of microbes has to be taken into account. According to the statement made by Dr. Edward Frankland to the representative of a London morning paper, "they are grandfathers in about ten minutes."

In the midst of all this storm about the microbes, it is perfectly natural that Professor Percy Frankland should have something to say. In a letter to "The Times," the principal portions of which will be found in another column, he points out the extraordinary discrepancy between the results arrived at by Dr. Klein and by Mr. Dibdin. In the Metropolitan Water Supply for January and February last year, Mr. Dibdin shows no higher number than 838 microbes per cubic centimetre; while Dr. Klein's figures range from 10,000 up to 50,000. Professor Percy Frankland says: "How two such entirely contradictory series of "results can have been introduced into one and the same "official report, without any explanation whatever being "offered, is difficult to understand." Last year, Mr. Dibdin found on the average 90 bacteria per cubic centimetre in the Kent water; while Dr. Klein was discovering numbers running up to 20,000. Professor Percy Frankland suggests, by way of escape from these conflicting statements, that the public had better confide in the report of the recent Royal Commission. The fact is that microbes are far more abundant than most people imagine; and if we are to escape them in any appreciable degree, we must revise our ordinary dietary to a very large extent. Some very sensible remarks on the hygienic character of the London Water Supply were made in the presidential address delivered last Tuesday at the Institution of Civil Engineers, by Mr. Wolfe Barry, who forms his estimate of the quality of the supply by its effect on the public health.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 926.)

THERE was, of course, one subject uppermost in everyone's mind last week—viz., the presidential election. It was generally, though far from universally, thought that the winning side would win; but the actual result was not so freely discounted as it might have been. When the fact became known, there was quite a boom, which, beginning in the American market, spread its influence widely abroad. Prices rose enthusiastically; and one pauses to consider whether it was all justifiable, and not excessive. Certainly it is a great gain to have escaped the disaster of Bryanism; but whether M'Kinleyism will prove as blessed a word as Mesopotamia remains to be seen. However, most people were very happy; and Consols rose 1⅛. The comfort did not extend to the Kaffir market, which exhibited the reverse of the bright side of the medal. The Money Market remains firm and unchanged, and may very well last so some weeks longer. In the Gas Market, business was extremely brisk, especially in the earlier portion of the week; while it tailed off a good bit towards the close. By far the larger bulk of transactions were in the two big issues —Gaslight "A" and Imperial Continental; and they both made considerable recovery in quotations. On the opening day, Tuesday (Monday was the semi-annual holiday), Gaslight "A" changed hands at 306½; but it soon ran away from these figures, and, rising freely, was marked on Saturday at 313½—a very substantial advance. A little was done in the secured issues; but they only held their own, without gaining anything. Moderate business was done in South Metropolitans, which quietly hardened in price, and closed at 147. Commercials were steady and unchanged. Nothing in the Suburban and Provincial division was touched, except British, which commanded about middle figures. Alliance old rose a point. In the Continental group, Imperial was much excited. It opened rather stronger, and, after a little hesitation, made a decided move up—closing at 226, which is fifteen points higher than its mark of the previous Saturday. Union and European were very steady. Movements among the rest were not numerous; Oriental new and Cape Town debenture had a rise; but Monte Video relapsed. Business in Water was extremely quiet; but the tendency showed an improvement. East London had a fair recovery; and Lambeth was advanced in view of the nice increase in the approaching dividend. It is understood that another Adventurers' share in the New River was privately negotiated at the price of £125,000.

The daily operations were: Great activity in Gas on Tuesday; Gaslight "A" and Imperial Continental being largely dealt in, at improving figures. The only change in quotation was a rise of ¼ in Oriental new. In Water, Lambeth gained 2; and ditto 7¼ per cent., 1. Activity and strength again characterized Gas on Wednesday; and Gaslight "A" advanced 2. East London Water rose 2. Thursday also was bright and buoyant. Gaslight "A" moved up 1; and Imperial, 5½. In Water, East London gained 3 more; and both Lambeths advanced 1. Business was more restricted on Friday; but quotations still went up gaily. Gaslight "A" and Imperial rose 2 each, and South Metropolitan, 1; but Monte Video fell ½. Lambeth Water rose 5. Saturday wound up a lively week, with a further gain of 2 each in Gaslight "A" and Imperial.

ELECTRIC LIGHTING MEMORANDA.

Breakdown of the City of London Electric Lighting—The Question of Electric Traction for Tramway Working.

IT is not our custom to notice in this column the little occasional mishaps that happen to even the best regulated central electric lighting stations; but this week it appears expedient that we should remind our readers, upon the evidence supplied in another column, that the irregular occultation of public and private electric lamps served from the largest and most improved generating stations still remains one of the undeniable drawbacks of this system of lighting. A very conspicuous example of this congenital defect of electricity supplied for the purpose of general lighting occurred in the City of London at about six o'clock on the evening of Thursday, the 29th ult., just when the heaviest demand was being made upon the resources of the Company's plant. For nearly an hour the whole of the electric lights in the western and central district of the City were out of service; so that but for the gas lighting there would have been darkness along the important line of thoroughfares from Old Broad Street to Ludgate Hill. An unkind Fate made the editorial office of our contemporary the "Electrician" one of the sufferers from this failure; and last week that publication made a humorous excuse on this score, for any "unusual obscurity" that might be found in its editorial remarks. The only shortcoming of the kind that we can detect in our excellently-conducted contemporary is to be found in its explanation, obviously supplied by authority, of why the lights went out. It appears that certain alterations of plant are going on at the Bankside station of the City of London

Electric Lighting Company, necessitating care in the running of the available machines, which on this occasion seems to have either been lacking or to have failed of its object. It is quite unnecessary to go into the details of a mishap of this kind. Wise observers of men and things have long agreed that it is only failures that can or need be explained; success explains itself. In this connection, it is permissible to remark that if the City of London Company, with the dearest system in the country, cannot get on without putting these inconveniences upon their customers, their future will not be particularly happy. As it is, there is a large amount of private lighting in the City of London. Important establishments possessing facilities for putting down a gas-engine and a dynamo can supply themselves with electric lighting at about one-fourth the cost of the public service; and the number of both large and small places of business that prefer the incandescent and other good systems of gas lighting to electricity, tends to increase rather than diminish. This movement receives a smart impulse from every such occurrence as that of the 29th ult.

The uncertainty that prevails in regard to the actual merits of electric traction is well illustrated by the recent debate in the London County Council on the question of the municipalization of the Metropolitan tramways. There is a division of opinion among the members of this peculiar body in regard to this matter, as there is over everything else; and the most deplorable feature of this disagreement with respect to the tramway question is—also as usual—the existence among a strong party in the Council of ulterior motives for their votes. The possibility of the introduction of electric traction for the improvement of the working and at the same time of the profit-earning capacity of the tramways, is one of the elements of the question which this party in the Council profess to regard as of vital importance. But what the same men are shrewdly suspected of desiring more than anything else is the control of the working of the undertakings in the interests of the so-called "Labour Party." Electric traction or no electric traction, this latter policy is one that no prudent man outside that party could support under existing circumstances. It would never do to create the demagogues of the "Labour Bench" the earthly Providence of many thousands of persons supported by a municipalized tramway service. It pleases these individuals to assume that there is not only a potentiality of improving the tramway service, in both of the respects already named, by introducing electric traction, but also that this potentiality is capable of immediate realization. One member of the Council who has taken this view of the subject—Mr. J. Allen Baker—has written to the Chairman a long letter in which it is urged that the question of electric traction has been solved so completely, that London might adopt the principle forthwith. But even the "Electrician" is fain to admit that the zeal of this advocate is that of the enthusiastic amateur, and goes beyond the facts. It is all very well to assert that electric traction for tramways is the thing to go in for; but when it comes to the question of what system is to be adopted, confusion supervenes. As the Earl of Denbigh observed at the Council meeting, it is well known that instances of electric traction proving cheaper than horse haulage can be adduced from American and Continental experience; but these all refer to the overhead trolley-wire system, which the Council itself has pronounced to be inapplicable to London. There is the conduit system of electric traction; but nobody knows enough of this to be able to declare positively that it is suitable for application to all London—especially if he had to back his opinion by putting his own money into a scheme of the kind. The experience of electric traction obtained in this country under the most favourable conditions, as offered by the Liverpool Overhead Railway and the City and South London Electric Railway, only goes to show that there would be many difficulties in the way of realizing similar results in street tramway working. Yet in these circumstances we have men like Mr. Benn telling the London County Council that "electric traction is being adopted all over the kingdom—great towns are adopting the system one after the other;" and nobody asked him what system he referred to, or what proofs he or anybody else could offer that there is actually in operation anywhere a system of the kind which could be applied straightway to the working of the London tramways. So the game of false pretence goes on. It was only on Friday last that Sir C. Rivers Wilson, addressing, as Chairman, the shareholders of the British Electric Traction (Pioneer) Company, said that the overhead trolley system must be looked to as "that which was most likely to be generally adopted; and it would certainly, if adopted, yield the best financial results." This may be so; but such a prospect can only be realized if everything that has barred the way of the trolley wire in this country should be removed, as to the probability of which revulsion everybody can form his own opinion.

Society of Arts.—The opening meeting of the 143rd session of the Society will be held on the 18th inst., when the Chairman of the Council (Major-Gen. Sir O. T. Burne, K.C.S.I., C.I.E.) will deliver an address on the "Arts, Manufactures, and Commerce of India." The arrangements for the session include a course of Cantor Lectures by Professor Vivian B. Lewes, F.I.C., F.C.S., on "The Use of Gas for Domestic Lighting;" and a paper by Professor Percy F. Frankland, F.R.S., on "London Water Supply."

A RETROSPECT OF VICTORIAN ENGINEERING.

Mr. J. Wolfe Barry, the President of the Institution of Civil Engineers, delivered last Tuesday his Inaugural Address before a large gathering of members and associates in the new building in Great George Street, Westminster. As was inevitable, the first consideration to commend itself to Mr. Barry as offering a suggestion of a foundation for his address was the unprecedented prolongation and the wonderful achievements of the happy and glorious reign of Her Most Gracious Majesty Queen Victoria, as surveyed from the standpoint of a Civil Engineer. We are likely to hear a great deal more of this epoch-making circumstance, if the promised Victorian Exhibitions should be successfully realized next year; and it is only necessary for the present to remark that when this stock-taking of the gains of the kingdom during the present reign is made manifest, that branch of engineering which has to do with the gas industry will not have the meanest or the smallest results to show for the labours of the past sixty years. The retrospective type of presidential address is the one of all others that presidents of engineers' societies should, as a rule, avoid. This is a warning that we never lose an opportunity of sounding for the benefit of those whom it may at any time concern, because the temptation to indulge in retrospect is very pressing upon engineers called to occupy the chair of a technical society, and pay for their elevation with an address; and there are too many of such occasions to permit of their being all acceptably "improved" in one and the same way.

While this general rule against indulgence in retrospect by composers of inaugural addresses holds good in most cases, there are occasions when it is quite the right and proper thing to do; and Mr. Wolfe Barry was fully justified in making retrospect the key of this year's address to the Institution of Civil Engineers. Yet here again, acceptability of so obvious a theme is largely a question of the style in which it is worked out. The inspiration of the civil engineer is a desire for the progressive realization of the aims of his profession; and the safest guide on the forward way is to be found by looking backward. All this is, of course, very obvious, trite, and commonplace. But it has been well observed that genius is not shown so much in the doing of extraordinary things, as in doing ordinary things extraordinarily well; and this definition particularly applies to the science and practice of engineering—including the preparation of inaugural addresses. A survey of engineering progress in the past may be the dullest and most wearisome of exercises, or it may be instinct with light and leading, in proportion as the writer succeeds in distinguishing the ideals of the present, the possible triumphs of the future, adumbrated in history.

There is nothing more characteristic of the Queen's reign than its engineering record; and of all the manifold differences that separate not merely in time, but also in things, the England of 1837 from the England of 1897, those which the country owes to its engineers are perhaps the most important, as they certainly are the most conspicuous. Mr. Wolfe Barry said on this head: "The material advances which the country had made during the Queen's reign were so remarkable, and had depended so much on engineering developments and progress, that they might at such a time as the present survey with profit the period covered between the accession in 1837 and the present time. No one could deny that the intervening years constituted the most important period yet known of engineering, or that the work of engineers during this period had had most far-reaching effects upon the material interests of the inhabitants of these islands, as, indeed, of the world at large, whether those effects had been produced by improved means of intercommunication by land and sea, of sanitation, or of labour-saving appliances."

It is difficult to realize that at the time of the Queen's accession only a very few isolated railways were open and worked for passenger traffic—no main arterial lines being in existence. "Practically speaking, therefore," as the President observes, "the railway system of these islands, which was many years in advance of other countries, had been developed in the Queen's reign." The management of the lines when made was for many years anything but enterprising; and it might even be said now, with some approach to verisimilitude, that the management of the traffic on our railways is hardly equal to the quality of the engineering. Mr. Wolfe Barry told again the story, which is so replete with warning, of the blindness of the early railway managers to their own true interests in discouraging the third-class passenger, who now really pays the dividends. Sir James Allport had "an uphill fight with the general managers of other railways, and even with his own Directors," to bring about the cultivation of third-class passenger traffic, and the reduction of the fares to a penny a mile. The President further asserted that Sir James Allport said a short time before his death in 1892 that "had he been a younger man he would have endeavoured to carry a tariff of ½d. per mile for third-class, and 1d. per mile for first-class passengers." This daring innovator must have been a continual terror to the easy-going routineers of the railway service with whom he was brought into contact.

If railway enterprise has effected so much on land during the Queen's reign, what is to be said about the contemporaneous development of transit by sea? Britannia ruled the waves then, of course; but at the date of the Queen's accession, the crossing of the Atlantic by vessels solely dependent upon steam for their

propulsion was "considered by high authorities to be a mathematical impossibility." It were devoutly to be wished that the weakness of the human mind, which pretends to the power of saying the last word about anything and everything, had been eradicated in the interval as completely as this particular manifestation of it has been exposed and falsified by the present facts. Mr. Barry claimed truly enough that "nowadays the journey to New York occupied a little over five days, being performed at an average speed of 21 knots by vessels of 12,000 tons, with engines of 30,000-horse power." He did not give any indication, however, of having realized the tremendous significance of this now familiar record. Imagination is evidently not Mr. Wolfe Barry's strongest point. Mining, the postal and telegraph service, and ocean telegraphy were very briefly mentioned in the address, which next dealt with the progress of town sanitation, water supply, and gas lighting.

If, as appears probable from a reasonable estimate, about 60,000 fewer people die every year in the thirty-six largest towns of the United Kingdom than would have so perished had the conditions of urban existence remained the same as those that prevailed when the Queen came to the throne, much of this increased economy of life, labour, and suffering is attributable to sanitary and water-works engineering. In this connection, Mr. Wolfe Barry spoke strongly and well respecting the semi-political agitation which has created the London Water Question of the day. He said "he had never been concerned professionally in the vexed question of the London Water Supply, but felt strongly that it was impossible to account for the low and lowering death-rate of London if the quality and quantity of the water being supplied to our four millions or five millions of people were bad or deficient. Without speaking as to the necessity of providing generally for the further development of the Metropolis, he, as a ratepayer, asked whether anything could be more extravagant, in face of the reports of two Royal Commissions, than to discard such supplies as that of the River Thames, the River Lea, the New River, and the Kent Wells, and enter upon enormous schemes for impounding water in Wales or Cumberland, and for the construction of an artificial river thence to London, until at least some undoubted authority proved an alteration of conditions and the necessity of such vast proposals. At present, the burden of proof was all the other way; and each Commission which was called for in the hope of its cursing the present supply had ended by blessing it altogether." This was well said; and the President knew he would not be misinterpreting the opinions of his professional brethren in using such plain language concerning the factitious water policy of a party in the London County Council. Under our system of government, however, every journalist and briefless barrister who chooses to take it upon himself to meddle in such matters considers it a proof of progressive statesmanship to clamour for a Royal Commission to ascertain the facts, and then neglect the information so procured.

"The cheapening and universal application of gas to towns and large villages marked another engineering success of the Queen's reign; and lately its use for heating purposes was a further most important step." This observation of the President is not specially incisive; but it is at least a recognition of the place of gas engineering in the advances of the reign which deserves acknowledgment. It is hardly to be expected that Mr. Wolfe Barry should be able to say anything very definite or novel respecting the progress of the gas industry during the last sixty years; but that there has been advancement of the most practical kind, a comparison, in the matter of prices only, of the state of gas lighting in London in 1837 with that of the present year would suffice to prove. This consideration leads us to a suggestion, which is that, where the materials exist in the archives of old-established gas undertakings, those engineers and managers who take an interest in the subject, and have access to the records, might construct an interesting paper or two on this very aspect of the gas industry. There are no living links between pre-Victorian and actual gas engineering; but it might be possible to reconstruct an 1837 gas-works from relics and memoranda in old books that have never been published. So far as gas-distributing plant is concerned, there are street lamp-posts now in use that date at least from the reign of William the Fourth or of the Fourth George.

There is not much more to be said by way of comment on Mr. Wolfe Barry's address. Speaking of the Institution itself, he dwelt strongly upon the need for the special training of engineers in order to enable the profession to cope with the manifold problems which must be reserved for engineers to solve in the future, as they have done in the past; and he spoke in favour of the idea of requiring candidates for the class of Associate Member to pass a qualifying examination. There is something to be said for this alteration in the standard of qualification for membership of the Institution in the lower grade. But it would be a change that wise and fore-seeing members of Council may be expected to think over many times before agreeing as to its expediency. It is the engineers who at present make the Institution, not the Institution which makes the engineers; and though the benefits of properly directed and thorough professional training are incontestable, English feeling and experience are as unquestionably in favour of the open and practical as compared with the scholastic standard of engineering efficiency. It may be doubted if some of the most eminent and busy of English engineers, whose judgment directs the expenditure of great sums of money, and controls the material development of the natural resources of the world, could satisfy the examiners of any of our engineering colleges. The Telfordian definition of engineering is too well known to need repetition. An American definition of an engineer is "a man who can do well with one dollar what any fool could do badly with two;" and this is a power that escapes the test of an examination-paper.

PERSONAL.

Mr. A. J. KINGDON has been appointed to succeed the late Mr. G. J. Gray in the secretaryship of the Colonial Gas Association, Limited. This change has been followed by the removal of the London offices of the Association to Suffolk House, Laurence Pountney Hill, E.C.

The shareholders of the Sandwich Gas Company have resolved to grant Mr. W. W. WOODRUFF, who has for many years been Secretary, and was formerly Manager, the sum of forty guineas, in recognition of his past services, and of the additional work which has fallen upon him in consequence of the formal winding up of the concern.

A gentleman, who does not wish his name to be known, has given a donation of £1000 to the Metropolitan Convalescent Institution, and has arranged that the privilege of recommending a certain number of patients for admission to the homes at Walton-on-Thames and Broadstairs shall be exercised by the Directors of The Gaslight and Coke Company and the South Metropolitan Gas Company, for the benefit of their employees and their wives and children.

Dr. WALLIS, the District Medical Officer of Health, has joined the Board of the East Grinstead Gas and Water Company. At a meeting of the District Council last Thursday, some amusement was caused by a letter from a prominent parishioner drawing attention to the inconsistency of the Medical Officer being at the same time a Director of the Gas and Water Company; but the Council seemed to regard the dual position as being more advantageous than otherwise.

The opening meeting for the present session of the Institution of Civil Engineers was signalized by the announcement of certain changes in the secretarial department. Our readers are aware that for many years the post of Honorary Secretary has been filled by Dr. WILLIAM POLE, F.R.S., one of the Metropolitan Gas Referees. From this position he has now retired; and, by a special vote, he has been elected an honorary member of the Institution. Another gentleman—Mr. JAMES FORREST—who, owing to ill-health, has lately withdrawn from active work for the Institution, after a connection, as Assistant-Secretary or Secretary, extending over fifty-four years, has been chosen to succeed Dr. Pole; and the secretaryship, as already announced in the "JOURNAL," has been conferred upon his late assistant, Dr. J. H. T. Tudsbery. Dr. Pole is one of the three oldest living members of the Institution—having joined it on the 7th of April, 1840. He had then been actively engaged in gas engineering, and was proposed by the eminent gas engineer of that day, Mr. George Lowe. It may be mentioned here that the changes lately made in the Charter and Bye-Laws of the Institution now come into operation.

Gas-Engines and Electric Lighting.—Mr. Henry O'Connor, Assoc.M.Inst.C.E., in the first of a series of lectures delivered at the Heriot-Watt College, Edinburgh, on the 28th ult., on "Gas Manufacture and Appliances," pointed out that it would be cheaper to make electric light by converting the coal into gas and turning it into power by means of gas-engines, and afterwards to utilize the residual coke for the purpose of raising steam, than to place the coal into boilers and convert the steam into power direct. The former method, he states, will show a saving of 50 per cent.

Southern District Association of Gas Engineers and Managers.—We learn from the circular issued by the Honorary Secretary of this Association (Mr. J. W. Helps, of Croydon) that the business to come before the members at their meeting next Thursday, at the Holborn Restaurant, will comprise the election of President and officers for 1897, the admission of new members, and the reading of two papers—one on "The Residuals Market," by Mr. W. E. Price, of Hampton Wick; and the other on "Regenerator Furnaces for Small Works," by Mr. W. B. Randall, of Waltham Cross.

Papers for the Institution of Civil Engineers.—The Council of the Institution of Civil Engineers have issued the usual list of subjects upon which they invite original communications; premiums being awarded for approved papers. Among the suggested topics we note the following: Methods of Enriching Coal Gas, and their Effect on its Calorific and Illuminating Values; Production and Enrichment of Water Gas; Methods of Conveying and Using Natural Gas; Application of Oil and Gas Engines to Tractive Purposes on Common Roads and on Tramways and to the Propulsion of Vessels; Electrolytic Action of Return Currents on Electrical Tramways on Gas and Water Mains, and the Best Means of Providing against Electrical Disturbances.

NOTES.

The Problem of Mechanical Road Traction.

In a summary of the present state of the horseless carriage problem, which it has done so much to make acute, the "Engineer" offers some observations calculated to be of service to those who may be attracted to the study of the subject. It is laid down as axiomatic that the light mineral oils, petroleum spirit, benzol, and the like, will not play a prominent part in the future of self-propelled vehicles, on account of the nuisance produced by the exhaust of all oil and spirit engines. The point of all others to be borne in mind, our contemporary holds, is that, in all cases where heat is used to produce motion, there are certain resulting products, the disposal of which is the greatest difficulty to be encountered in the road to complete success. It will be found far easier to scheme a motor for a vehicle than to perfect arrangements for preventing the discharge of offensive products of combustion and steam. The running of a number of oil-engine motors in the streets would be productive of an intolerable nuisance, for these engines all give off an evil-smelling, smoky vapour. The spirit-engine is far superior in this respect to its rival, which is an important point in its favour; but the character of the fuel is a greater drawback. Our contemporary concludes that the self-propelled carriage of the future will be worked by steam, generated by oil fuel in the case of light vehicles, and by coal or coke in that of heavy country vans. The steam will have to be condensed, and ample security for starting must be provided. It is not considered impossible that room may be found for electric carriages worked by accumulators, a store of which for town use could be charged far more economically by means of a gas-engine and a dynamo than the cost of the horse-keep which they would render unnecessary.

Argon in Coal.

Now that the existence of the two new gases, which are almost a new form of matter—argon and helium—is established beyond the possibility of cavil, chemists are finding them everywhere. The last source of argon made known to science is the fire-damp of certain French coal mines. Professor M. Schlœsing, jun., has sent to the "Comptes Rendus" a statement on this subject, from which it appears that the new elements are to be found in the deepest mine gases in about the same proportions as they exist elsewhere. Argon has been found in every sample of fire-damp explored for it. Nitrogen and argon are met with here in a proportion which seems to have no relation with methane, the principal gaseous product derived from the material coal. This is an additional reason for not regarding these gases as originating in any way in the decomposition of coal. The idea that the argon of fire-damp comes from "fossil air," which has been imprisoned in the coal for a long time, was at first entertained by M. Schlœsing, but has been dismissed as untenable. He now thinks the air found in fire-damp may have been derived from water filtering down from the surface of the ground, and holding air in solution. And, after all, the argon found in coal mines is not necessarily derived from atmospheric air at all. We do not know the source of the argon on our globe, and therefore cannot explain why it should or should not occur as plentifully in the subterranean regions as in the air. The fact of its being there is all that can be confidently stated respecting it. In proportion it issmall; most of the coals which have been examined containing only 1-200,000th of it, or less.

The Treatment of "Gassed" Subjects.

It is stated in the "Chemical Trade Journal" that Mr. Towers, of Widnes, has worked out a very complete equipment for the use of oxygen in connection with the prevention of gas poisoning, and also for rescue work in factories where men are exposed to the risk of "gassing." The chief piece of apparatus is a respirator, which is made in two forms—one for dealing with gases capable of being readily absorbed, and the other for use in all cases. The latter consists of a mouthpiece with inlet and outlet valves and a pipe connection for the supply to the wearer of air or air and oxygen. This pattern of rescue equipment has been adopted by the United Alkali Company for all their works. Mr. Douglas Herman is also reported to have devised an excellent face-piece to cover the nose and mouth, equipped with which a man has worked for twenty minutes in a hot flue full of producer gas. It is noted that sulphuretted hydrogen is one of the most dangerous of gases; insensibility supervening very suddenly upon the inhalation of even small quantities of it. Oxygen is the best restorative; the oxygen tube being placed in the mouth, and a gentle flow permitted to find its way into the lungs as long as is necessary. In bad cases, artificial respiration may be resorted to with advantage.

A New Safety Apparatus for Miners.

Death in coal mines in which explosions have occurred, is in most instances due to suffocation from the after-damp. The irrespirable gases which go by that name are also dangerous to the relief gangs. If the miners were in a position to avoid breathing these gases, which contain a large proportion of carbonic oxide, the number of fatalities would be much diminished. Professor G. Gärtner, of Vienna, has devised the "Pneumatophore," which is an apparatus for the supply of unvitiated oxygen to men working in poisonous atmospheres. It consists of a square sack of non-porous material with an internal absorbent coating. The sack contains a steel vessel, 30·5 cubic inches capacity, filled under pressure with 2·1 cubic feet of oxygen, and a glass vessel containing ¾ pint of 25 per cent. solution of caustic soda. This glass vessel is protected by a perforated metal casing; but this may be broken by turning a screw, the handle of which is (like the valve of the oxygen flask) outside the sack. When the apparatus is needed for use, the soda flask is broken, and the solution saturates the lining of the sack. A mouthpiece attached to a tube leading into the sack is brought to the mouth; and oxygen is admitted to the sack from the cylinder. The miner then inhales and exhales through the mouthpiece, and admits more oxygen to the sack as required. The carbonic acid in the exhaled air is absorbed by the solution of soda. The apparatus is self-contained, and when in use is carried on the chest by shoulder straps. It weighs about 10 lbs.; and its carrier is 14 inches long, 10 inches wide, and 4 inches deep. It is not damaged by falls or shocks, and should be of service to firemen, and workers in sewers and wells, as well as on gas-works and in mines.

A Sanitary House.

An extraordinary suggestion for house construction has been offered by Dr. W. van der Heyden, of Yokohama and Utrecht, as a solution of the problem of hygienic building. A house constructed in the grounds of the General Hospital of Yokohama, after Dr. van der Heyden's design, was recently illustrated in "Engineering." Roughly, the house is 44 feet long, 23 feet wide, and 17 feet high. The walls are of glass, in two thicknesses of plate, separated by a space of about 4 inches, which is filled with a strong solution of alum for a common soda salt. The roof is made of glass plates with strips of india-rubber between the joints covered with a wood and cement framework. The house is therefore a well-lighted box of glass, with no openings, cracks, or chinks to admit air, damp, dust, or insects. The solution of salt in the walls may be coloured if desired to tone down the effect of bright sunlight. The floor of the house is of double planking, with sawdust between. The entrance is by a sort of air-lock, to reduce the quantity of air admitted with each person. Fresh air is obtained from a pipe which rises vertically from the ground at some distance from the house, and is conveyed into it by means of a pipe. Before entering the house, the air is filtered through cotton wool; and as the air emerges from the filter, it strikes a large pane of glass coated with glycerine, to catch any stray microbes that might pass the filter. The outlet for the vitiated air is by a shaft. It is stated that the temperature inside the house is kept uniform by the heat absorbing and retaining action of the salt solution in the walls. When the sun shines on the walls, its heat, instead of passing through to raise the temperature inside, as it does in a greenhouse, is taken up by the liquid, and more salt enters into solution. At night the process is reversed—the walls giving out a part of the heat they have absorbed during the day.

Mr. Thomas Glover's Coal-Testing Plant.—By inadvertence, the arrangement of coal-testing plant illustrated in the "JOURNAL" last week (p. 848) was stated to be at the West Bromwich Gas-Works, instead of by Mr. T. Glover, of West Bromwich. The purpose of the drawings was to illustrate his paper at the Midland Association meeting, and not to represent any building or plant actually in existence.

The Rainfall in September.—The statement made in the "JOURNAL" for the 27th ult., on the authority of Messrs. Crookes and Dewar, as to the month of September being one of the wettest on record, is confirmed by a report issued by the Meteorological Section of the Croydon Microscopical and Natural History Club. It is therein stated that there has been no such wet September in the long record at Greenwich; and Mr. Baldwin Latham reports that it was the wettest September in 207 years in that part of the country.

An Improved Street-Lamp.—A new street-lamp, constructed according to the patent of Captain Loftus, has been brought out by the Sunlight and Safety Lamp Company, Limited, of Birmingham, and has been tried experimentally in that city. By a special arrangement of the panes of glass, the light is augmented, and at the same time directed to the part of the footpath between the lamps which is usually in darkness; thus remedying a recognized defect of the present system of public lighting. The lamp is stated to be peculiarly suitable for use with the incandescent gas system.

Frangibility of Glass Chimneys.—According to the "Ironmonger," a number of persons engaged in the retail trade complain that they experience an immense amount of trouble, and some loss of money and custom, by reason of the unreliabilty of the glass chimneys used in connection with incandescent gas lighting. The same trouble exists to some extent with oil-lamp chimneys; but it is more felt with the gas-light chimneys. These, it is stated, fly to pieces in the process of cooling after the light is turned off or down; and the only remedy seems to be the use of mica chimneys. Our contemporary thinks it would be very interesting to learn why the glass articles fail, as well as whether anybody has tried, successfully or otherwise, the plan of boiling the glass chimneys before selling or using them.

TECHNICAL RECORD.

A MODERN RETORT-HOUSE.

By W. A. Miller, of Cincinnati.

[A Paper read at the Annual Meeting of the American Gaslight Association, Oct. 27, 1896.]

While in attendance at the meeting of the Ohio Gaslight Association, your able President [Mr. C. J. Russell Humphreys] made a thorough inspection of the new No. 5 retort-house of the Cincinnati Gaslight and Coke Company; and, regarding it more complete in all of its appointments than any he had seen, he requested a paper descriptive of it to be read before this meeting.

Although the retort-house contains some features essentially unique, its general plan would be adaptable, with slight modifications, to any locality where it should be desirable to have stoking machines to take the place of hand labour. As the most important feature considered in its design was that the operating-floor should be placed at an elevation sufficiently high to preclude the possibility of having the benches submerged during the time of high water, it may be of interest to mention the conditions that have heretofore existed at such times in the Cincinnati works.

In the year 1884, the crest of the unprecedented flood in the Ohio River left its mark near the centre of the top retorts at the West-end station (the old works), registering a stage of 72 feet above low-water mark. Operations were then suspended in the works for about ten days; and as the city was without gas, lamps and candles were required where electric lights were not in use. The overflow ran in strong currents through the streets adjoining the gas-works, and the employees were ferried to and from the works. Since that time we have been reminded annually of the experiences of that year by the visitation of flood water in the cellar of the retort-house. Though the water did not reach the grate-bars of the benches, we were always apprehensive until it commenced to recede, lest it should attain a greater height than ever before.

The east station had been in course of construction for two years at the time of the flood in 1884, and the crest of the rise reached the floor of the retort-house. The bench arches and the pier walls had been finished, and work commenced upon the construction of furnaces. After the subsidence of the flood, the Company concluded that the retort-house floor should be raised 3 feet—level with the top of the window-sills. Making the change involved the tearing down and rebuilding of the pier walls and bench arches to correspond with the new floor-level. The work progressed rapidly, and the manufacture of gas was commenced in the Fall of 1884, since which time, had the flood contingency arisen, and had the old works been shut down, sufficient gas could have been produced at the Station to supply all the demands in February, the month of floods—the suspending of the lighting of the submerged districts being considered.

In 1892, with the average yearly increase in consumption, it was evident that the above condition would terminate within a few years; and prudence dictated that No. 5 retort-house should be built at the old works, to have a capacity of 4 million cubic feet per day, and to have its operating-floor beyond the reach of floods. Unless the flood contingency was considered, a new carbonizing plant was not an apparent necessity, as prior to this time the old and new works had not been working to their maximum capacities.

Not having the available ground upon which to construct No. 5 retort-house, the Globe Rolling Mill (adjoining the west side of the works) was purchased. The lot had a frontage of 250 feet on Front Street, and extended back 500 feet to the Ohio River. Having acquired possession of that property, the ground plan of the works was thereby shaped rectangular; being bounded by three streets and the river, with Front Street passing nearly through its centre, parallel with the river, thus separating the purifying buildings and gasholders from the carbonizing buildings, coke-bins, and coal storage sheds and yards.

The retort-house at the old works contained 78 benches of sixes, equipped with regenerator furnaces, and two retort-discharging machines. In the rear there were coke-bins and coal-yards. The coal supply was received in barges, and good facilities were provided for elevating and discharging it into sheds and yards. The coke was drawn into the cellar, and received into cars, upon tracks parallel to benches and leading to hydraulic hoists. It was thereby elevated and dumped into coke-bins, from which it was loaded, after passing over fixed screens, into waggons for the market.

Taken as a whole, it was by no means an out-of-date plant as compared with many other large works. But the carbonizing expenses per 1000 cubic feet of gas made were much greater than at the east station, where, by the operation of the Ross charging and discharging machines, and by the complete system in vogue for handling coal and coke, labour was reduced to a minimum, and there was obtained an average yield per diem of 50,000 cubic feet of gas per man, including the machine men, lid men, furnace and coke men, and coal men—in other words, all labour required in handling coal and coke in the retort-house and in depositing the residual coke into the storage bins. The coke used under the benches was 7 per cent. more than at the east station, the saving of which, together with that due to the operation of stoking-machines, would have been sufficient inducement to warrant the Company building a new retort-house, even if the flood contingency were not considered.

In deciding upon the plan and construction of No. 5 retort-house it was desired that it should embrace every new feature that would tend to facilitate and economize production, and that it should be as complete as possible in all its appointments. To meet these conditions it was designed for the operation of the Ross steam charging and discharging machines; and, as the retort-house best adapted to their satisfactory use was, in our judgment, the one at the east station, the same general plan was adopted, incorporating therein all improvements that had been pointed out by actual practice and experience during the eight years it had been in operation. At the same time, every necessary precaution was taken to avoid the risk of temporary suspension of operations in the works at times of flood water in the Ohio River.

The plans were mapped out by General Hickenlooper, the President of the Company; and the details and specifications in accord therewith were prepared by a local architect. Before work was commenced upon the foundation plans, test holes were bored 50 feet apart, from the front to the rear of the lot upon which No. 5 retort-house was to be erected. It was found that about one-third of the building would rest upon clay soil, and the remainder upon from 1 to 35 feet of ashes, slag, and other rolling-mill refuse. As the Company concluded to take every precaution to secure a good foundation, it was decided to drive 735 piles, varying in length from 30 to 45 feet, under all foundations that would otherwise have been supported by ashes.

The dimensions of the building—347 ft. 6 in. in length and 110 ft. in width—were determined upon by the following considerations: Size of retort, 15 in. by 25 in. by 9 ft. 6 in. inside measure; number of retorts in each bench, nine; width of the benches from centre to centre of pier walls, 11 feet; thickness of the back walls of the benches, 1 ft. 6 in.; width of the stack, 21 feet; number of benches, 52—26 benches of nines, being about the maximum number one pair of the machines can serve; space required for the operation of the machines between the face of the benches and the columns supporting the coal bins and the main roof, 19 ft. 6 in.; span of main roof truss, from centre to centre of the supporting columns, 61 feet; gauge of the machine tracks, 8 ft. 6 in.; space required between the ends of the benches and the front and rear walls of the building, to allow for the passage of the machines from one side of the house to the other, 20 feet; total length of the bench walls from the north to the south end of the building, including an arched passage-way in the centre of the house, 301 ft. 10 in. Four turn-tables, 14 feet in diameter, are provided, one being located at each end of the trackways. The cellar floor is about 2 feet above the street in front of the building, and 14 ft. 6 in. below the operating-floor. The tops of the coal-bins are placed 25 ft. 6 in. above the floor. On the same level, at each end of the house, there is a gallery, and in the centre a bridge supporting trackways upon which coal cars are run when delivering coal into the bins. In each of the corners of the building there are machine-rooms in which all repairs are made upon the stoking-machines. The walls of the machine-rooms are carried up sufficiently high above main roof to enclose water-storage tanks; and they are topped out as square towers.

All sub-foundations consist of a heavy bed of good concrete dimension limestone embedded in cement mortar and limestone water-table, the top of which is level with the floor of the basement. The basement walls are built in piers of large dimension limestone laid as range work, the courses of masonry gradually decreasing in thickness from 20 inches at the bottom to 12 inches at the top. Each stone is of the same width as the thickness of the walls; having pitched faces inside and outside. The basement is capped by a heavy course of freestone water-table, which presents a massiveness in harmony with the foundation and superstructure.

The superstructure is built of hard red bricks and freestone trimmings, laid in cement mortar. The walls are 27 inches thick at the pilasters, and 22 inches thick at the panels. The exterior face of the walls is built of repressed stock bricks, laid in mortar of the same colour; and the windows and doors are capped with projecting brick arches.

Brick piers 3 feet square are built in the basement, upon which rest one end of double 10-inch cross beams which support the 6-inch longitudinal beams and cast-iron plates of the working floor; also the cast-iron columns which support the main roof, one side of the coal bins, and the roof over the same.

The main roof trusses are of the "Fink" pattern, and constructed of angles and plate steel. The purlins are angle steel, and are secured by bolts through elongated holes to angle knees riveted to the trusses. The roofs are covered with heavy black slate, secured to the purlins by copper hooks. The whole roof is surmounted by a lantern running the full length of the building. On each side of the lantern there is a row of pivoted windows, through which the retort-house is ventilated and the upper part lighted. The sashes are of cast-iron, and the glass with which they are glazed is fastened by steel pins. The towers enclosing the water-tanks have dormer windows on all sides; and they add much to the good appearance of the

building. The gutters are cast-iron, and those on the sides of the building and towers form the cornice.

The coal-bins have a capacity of 1000 tons; being sufficient for more than two days' supply when working the retort-house to its maximum capacity. The bottoms of the coal-bins are constructed of cast-iron flanged plates bolted together. The flanges are planed to secure tight joints; thereby preventing the sifting of coal dust upon the floor below them. The inclination of the bottom is 41½° with the horizontal. The plates rest upon 6-inch I-beams, supported at one end by the side walls of the building, and the other end framed into 8-inch I-beams, fitted between the cast-iron columns. The fronts of the bins are constructed of steel plates riveted to T-iron studding. Directly opposite the side retorts of each bench there is a coal-shoot and gate attached to the front of the bins, from which the hopper of the charging-machine can be filled with coal. By providing ample storage in bins, sufficient coal can be elevated in the daytime to run over nights and Sundays if desired; and the coal can be elevated more economically than if it were necessary to elevate daily throughout the 24 hours.

The coal is delivered at the works' landing in barges containing 500 tons. It is shovelled from the barge into cars that contain 2 tons each; and, when filled, they are hooked to a cable and elevated up an incline, the top of which is upon a level with the retort-house coal-bins. The cars on entering the engine-room at the top of the incline are unhooked automatically, and given sufficient momentum by the engines to send them into the retort-house; thus saving the time and labour that would be involved if the cars were stopped and pushed in by the men employed to dump them. The height of the lift varies with the state of the river—from 95 feet at times of low water to 30 feet during high water. The capacity of the elevator is 60 tons per hour; and the cost of elevating from the barges into the retort-house coal-bins, or into the coal-yards, is about 20c. per ton. The cars have hinged bottoms; and they are discharged by disengaging a pawl from a ratchet, fixed to a central shaft, from which chains connecting with the car bottoms are unwound.

When the barges cannot be received at the works' landing, recourse will be had to the coal stored in the yards, which will be elevated to the level of the coal bins, a distance of 40 feet, by hydraulic lifts, operated by steam-pumps, equipped with automatic steam pressure-regulators for maintaining uniform water pressure. By this system, 40 tons of coal can be elevated per hour, on two hoists working side by side; and the coal carbonized in 24 hours can be always elevated in the daytime.

The bench arches are segmental, constructed with blocks 13 inches in depth, over the top of which hollow tile arches are built, with an intervening space of 3 inches between them. The arches are built to within 10 inches of the face of the pier walls, and cast-iron lintels are used to square up the fronts of the benches. Between the haunches of the arches and up to the level of the lintels, fire-bricks are used for filling, on top of which five courses of red brick are laid dry, and 1 inch apart, between the face walls. The last five courses are embedded in mortar.

The exit-flues from the benches are 5 feet below the floor-line, and are built in the back walls. The flues are built plumb up to the floor-line, where auxiliary openings have been left in them. These are covered by tiles which can be reached from the fronts of the benches, and will be removed before the lower exit-flues become submerged in times of floods. Above the floor-line the flues incline toward the centres of the benches; and at the top of the stack those of every two benches on opposite sides are built together as one chimney. The walls of the chimneys are 9 inches in thickness, and they are securely bound together by tie-rods connecting cast-iron angles. The chimneys are 6 feet in height above the stack and 4 feet apart; thus leaving a passage-way from one side of the stack to the other. The benches are constructed on the regenerative principle; but, owing to the flood contingency, the waste heat flues from the benches were not carried down low enough to heat the primary air supply. The secondary air is heated by passing through horizontal flues below the floor-line. The furnaces are 10 feet in depth, and are 4 ft. 6 in. in length by 2 ft. 6 in. in width at a foot above the grate-bars.

The ash-pans and grates are 2 feet in width, in front of which there are large furnace doors and frames, having planed surfaces, and fitted with cotter bars and screws. The back walls of the furnaces are built plumb 15 inches above the grate-bars, and then offset 6 inches; then 2 feet plumb, and again offset 6 inches; then they are racked back to the rear wall of the benches. On the first offset, a set of temporary bars can be rested, which will be forced through the coke just prior to the time of clinkering, to support it while the ashes and clinkers are being removed from the bottom of the furnace. On the second offset will rest the grate-bars in times of high water, as experienced in 1884. Opposite these, auxiliary furnace doors and frames have been built in the front walls of the furnaces; and the openings in the frames have been built up with bricks, which can be removed should the necessity arise. The furnaces are charged through cast-iron shoots lined with fire-brick, the tops of which are level with the floor, and covered with hinged lids. The furnace shoots are constructed so as to slide as the brickwork of the benches expands.

In the pier walls of the benches cast-iron boxes are built, into which the double 10-inch I-beams which support the floor extend, and rest upon a train of cast-iron rollers. When the benches are fired up, the beams will not be strained as the brickwork expands (which would happen if they were built in brickwork), but will roll a little farther back into the cast-iron box. The floor-plates in the fronts of the benches have been constructed in detail to provide for this expansion. The floor-beams, carrying the cast-iron floor-plates of the operating-floor are separated ¼ inch at the ends, and are fastened together by fish-plates and bolts; the bolt-holes being elongated to allow for expansion and contraction.

The retorts are oval shaped, and are set in three tiers with their centres in vertical and horizontal lines; thus enabling the machines to draw or charge three retorts while in one position. The horizontal distance between the retorts is five inches; and the vertical distance 3 inches. The mouthpieces are fitted with self-sealing lids, cotter bars, and screws, and are secured to the retorts by T-head bolts. Supplementary to the bolts three 4 in. by 4 in. T-bars are placed horizontally against the flanges of the mouthpieces, and are secured by angles and bolts to the 8-inch I-beam buckstays of the pier walls. The stand-pipes are 6-inch cast-iron flange and spigot pipes. The flanges are faced to ensure tight joints when bolted to the bridge-pipes. The dip-pipes and bridge-pipes also have faced flanges. Each bridge-pipe is provided with cover lids, fitted with cotter bars, hinge pins, and screws. One lid affords access to the cross-pipe and dip, and the other to the stand-pipe.

The hydraulic main is of combination steel and cast-iron construction, 24 inches in width and depth, and equipped with a diaphragm and cleaning-pocket running the full length of each section. The bottom is so shaped that the lowest part is directly under the diaphragm, to facilitate the removal of any heavy deposit that may accumulate from time to time. One side of each of the hand-holes on the top of the pocket is flush with the curved bottom plate of the main; and when heavy tar has been deposited therein, an ordinary scraper can be used to advantage to remove it. There are six sections of main upon each range of thirteen benches. Five of the sections serve two benches each, and one three benches. The top plate projects 12 inches over the back of the main, being supported by brackets; thus forming a walk, and also a cover to prevent the accumulation of dirt upon the clean-out pocket. The hydraulic main is supported by cast-iron stands resting upon horizontal I-beams that connect the tops of the pier wall buckstays on opposite sides of the stack of benches. These beams project 12 inches beyond the buckstaves; and when it becomes necessary to level up the hydraulic main, this can be done very easily by the use of a jack-screw and strut from the retort-house floor. As the take-off pipes, tar-pipes and bridge-pipes are all supported by the same I-beam, all will be raised together without any connections being strained. A double-seal valve is attached to each section of the hydraulic main, and its overflow connected with the main tar-pipes. It consists of two valves, each within a separate compartment, and having united and independent adjusting stems. One of the valves will be adjusted to allow part of the tar made to flow continuously from the bottom of the hydraulic; the other, to maintain the seal on the dip-pipe at the proper level by allowing the excess of liquor to overflow.

On each side of the stack of benches, a gas-main is suspended from horizontal cross beams, supported by uprights resting upon the I-beams mentioned above. Each section of the hydraulic is connected with the gas-main by an 8-inch pipe and valve. The gas-main increases in diameter from 10 inches at the north and south ends of both stacks, to 12 inches, 14 inches, and 16 inches at the centre of the house. The four gas-mains are connected by 16-inch valves to the 24-inch pipe running east and west, beneath the bridge supporting the trackways. The route of the gas is from the retort to the hydraulic main, the take-off, the gas-main, and to the centre of the house; thence east or west, or in both directions, to the sides of the building; thence south under the coal-bins to the end of the building; then down and into the air condensers in the basement.

The air condensers are located between the basement side walls and the piers supporting the coal-bins and main roof. They consist of cast-iron rectangular boxes, having a 24-inch flanged pipe connection on one side, and eleven hubs for 10-inch standard gas-pipes on the other. The hub sides of the boxes are set facing each other at the north and south ends, and on both sides of the building, and are connected by eleven lines of 10 inch pipes, having a total gradient of 2 feet. When the retort-house is working up to its maximum capacity, the condensing-pipes therein will have 7 square feet of surface to cool 1000 cubic feet of gas per minute.

The tar-pipes from the hydraulic main connect with the seal boxes, set just below the floor, at the south end of the benches. Overflowing therefrom, it runs either east or west, or in both directions, to the south end of the air condensers; it then flows along with the gas through the bottom tier of pipes. From the outlet of the air condensers, on each side of the basement, the gas and tar flow through a 24-inch pipe (underground) to the centre of the north end of the building, where the two lines are connected by a 30-inch T-piece. Each of the two tar-pipes from the hydraulic main upon the north half of the benches connects with the 24-inch gas-main; and from that point all the tar flows with the gas produced to drip-boxes near the inlets to the multitubular condensers.

Three of each of the Ross steam charging and discharging machines have been installed in No. 5 retort-house. This type of machine was first introduced into the Cincinnati Gas-Works in 1879. Since that time, so many improvements have been made in the details of its construction, that, in our judgment, retorts can be drawn and charged with it more expeditiously than with any other, and at less expense for labour and repairs. It is true that we have had no experience with any but the Ross machines; but we have drawn and charged 45 retorts per hour, equivalent to 1080 retorts per day, with one pair of machines, two engineers, and one assistant (to fill the coal-hopper upon the charger). This is, so far as we know, in excess of the rated capacity of any other machine, as given by the patentee, manufacturer, or engineer using them. The actual time required per draw, from the time of slacking off the first retort until the last lid is closed, divided by the number of retorts drawn and charged, will not exceed 50 seconds. The drawing-machine has given almost perfect satisfaction for fifteen years, during which time, a number of improvements have been made in various details. The improved charger has been in use since 1888; and its simplicity, both in construction and operation, commends its use. As to the evenness with which the coal is laid in the retorts, it is, of course, dependent upon the skill and care exercised by the engineer. The charges are laid evenly throughout the length of the retorts. However, to ensure such a condition, it is the practice to have passed over each charge a long rake, which is also used to push back any coal left in the mouthpieces before closing the retort-lids. This operation is quickly performed by the lid men working in pairs—one man using the rake, the other closing the lids. By the use of the charger, after the hoppers have been adjusted to contain the desired quantity of coal for each charge, the weighing of coal can be dispensed with, and thus effect a saving equivalent to the cost of repairs upon both machines.

At the east station, there has not been a pound of coal weighed for eight years; and yet at the end of each year, the discrepancy between the measured stock of coal in the yards and that shown by the books is always less than at the west station, where every pound of coal carbonized is run over a scale, and apparently accurately weighed. Also the yearly make at the latter works is only one-half that of the former. The method of estimating the coal carbonized is as follows: Prior to the delivery of the barges at the works' landing, they are measured by an officer appointed by the Cincinnati Chamber of Commerce. From the measurements taken of the length, breadth, and depth of barges, the contents in bushels of 2688 cubic inches are calculated. When unloading the barges, a record is kept of the total number of car loads elevated from each one; and the average contents of each car is obtained by dividing the number of bushels, as shown by the gauger's certificate, by the number of car loads elevated. A record is also kept of the number of car loads dumped daily into the retort-house coal-bins and also into the coal-yards. The contents of each car load being known, and also the weight of the coal per bushel, the number of tons dumped into the retort-house bins can be easily calculated. The stock of coal in the bins is checked every ten days with the balance that should be in them as shown by the books. If we find that the stock is in excess of that entered in the books, for the following ten days the weight of each charge of coal per retort will be reduced 1 per cent.; but if there is a shortage in the stock, then for ten days thereafter 1 per cent. will be added to the estimated weight of each charge per retort, and so on. By this system a balance is found, and the coal account is kept practically correct.

INCLINED RETORTS UP TO DATE.

By F. EGNER, of Norfolk (Va.).

[From a Paper Presented at the Annual Meeting of the American Gaslight Association, Oct. 27, 1896.]

At a meeting of this Association held at Savannah six years ago, the writer presented a paper on "Inclined Retorts;"* and in view of the now well-established success of this great improvement in the method of making coal gas, the very little which has been said upon the subject in the American technical journals, and the importance of the same to the gas industry, the paper herewith presented to you was prepared.

As it is often profitable to know how not to do a thing, let us first of all review the failures, and their causes, of the "inclines." Speaking of my own experience with that system of retort-setting, there were five principal reasons why our inclines were not successful. In the first place, the long twisted charging mouthpieces, according to the original design of M. Coze, which had worked reasonably well on our single experimental bench for two years, when set back to back, with only a few feet of space between, soon developed objectionable features, not known or suspected before—not suspected, because we had been led to believe that similar settings had been, and were at that time, operated with entire success at Rheims, by M. Coze.

This carries us to the second error, connected with which the misleading impressions mentioned before bore a prominent part. Not only were the retorts set too closely together at the back of the bench, but no provision had been made to prevent the sliding forward of any part of the setting, or to relieve the clay retorts from the weight of the heavy ironwork.

As might have been expected, every one of the eight settings did slide forward into the fire-room—two of the benches as much as 6 inches. Let it be noted here that for years before that time, we had invariably supported the retort ironwork of our old horizontal settings independently of the bench brickwork; and we should not have neglected doing it with the inclines but for the belief as to the operation of the design furnished us. Indeed, we talked of doing it anyhow; but because of the considerable additional cost, and the alleged lack of necessity to do it, this precaution was not taken.

The latter probably led to cause number three—viz., failure of the furnace. The furnace was designed by the late Mr. Arndt, then Engineer of the Chicago Gaslight Company. It was known to have been used for some years with entire satisfaction; and we accepted it in consequence without question. But when the retorts and tiles in the upper part of the furnace slid forward bodily, it seems that the vertical air and discharge flues of the furnace were ruptured; and as the design was such that it was impossible to make repairs, the furnace was ruined as to the regenerative feature of it. During the first seven days of operating the "inclines," about 20 per cent. of the coke made was used; and this closely approximated to 12 per cent. of fuel on the coal carbonized—the results claimed for the furnace.

The fourth cause of failure was the position of the take-off pipes, which we had changed to be connected to the upper and back mouthpieces of the bench, instead of to the lower and front mouthpieces. It was found that the gas and vapours passing off in this way were subjected to so much heat that pitch was formed and deposited in the hydraulic main, though the latter was not at all too hot. Pitch in the main caused stopped ascension-pipes and smoke on the top of the stack, and drove the men from their work. That this was the cause of pitch in the main was clearly proved after two of the benches were altered in accordance with the original design, when the trouble ceased at once. At this period of our operation, the Company had declined to spend another cent. on the inclined retorts. But, at the writer's solicitation, permission was given to make the change mentioned; and through the liberality of a gentleman interested in the success of the retorts, the change was effected, with the result stated. Finally, an exhauster connected with the inclined retorts, but not in operation at the time, was blown up by means of an explosive placed near it. This happened between two and three o'clock in the morning, when no one was supposed to have any business in the engine-room, and there was not even a light there.

The errors in design which were responsible more than anything else for the failure of our Coze benches—I will say which were alone the cause of the failure—caused also the failure of two similar benches at the works of the Washington (D.C.) Gas Company, only that at Washington the heavy charging mouthpieces bore the principal part. The writer has the story of that failure furnished, through the courtesy of the General Manager of the Company (Mr. John Leetch), by Mr. Holden, the Superintendent of the east station of the Company; but it is so very much like his own that it may well be omitted.

The most notable failure of the "inclines" was that at the Kensal Green station of The Gaslight and Coke Company, London, where an installation of 460 retorts was introduced upon a plan similar to ours, the whole of which was condemned and stopped work. In a letter written to the "JOURNAL OF GAS LIGHTING" for July 23, 1895, Mr. Maurice Graham stated that the old Coze pattern of inclined retorts, "with the cast-iron bent mouthpiece, was a failure." Mr. Graham is a member of the firm of Messrs. Little and Graham, who have erected 95 per cent. of the now successfully operated "inclines"—or let us call them, as they do in England, "slopers"—and he may be considered an authority on the subject. From the publication just mentioned, we learn that the "slopers" are now in successful operation at the gas-works at Bow Common, Burnley, Coventry, Chatterley, Droylsden, Gateshead, Huddersfield, Leigh, Middlesbrough, Newcastle-under-Lyme, Rochdale, Salford, Tunstall, West Greenwich, West Hartlepool, Brentford, and Southall. Out of this list, Mr. W. R. Herring, the Engineer and Manager of the Huddersfield Corporation Gas-Works, stated that "there were no less than eight works where the system had been extended after a lengthened trial." The same gentleman is also reported to have said that he had put in 180 15-feet "slopers" in 1893, and, after a satisfactory experience, had added 216 more on the same principle; and in the then ensuing winter, he expected to make at least 4 million cubic feet of gas per day in them. The difference in the nature of the work may be gathered from his remarks, where he stated that now the men, instead of stripping, as they frequently did when operating the horizontals, often worked with their coats on; and the work of charging the "slopers," as compared with the horizontals, was really only women's work. In an eight-hour shift, the men worked actually only four hours. It would be well to remember the following remarks by Mr. Herring, as reported in the "JOURNAL OF GAS LIGHTING:"* "Some were too apt to think that, if they introduced improve-

* See "JOURNAL," Vol. LVI., p. 1045.

* See Vol. LXV., p. 1128.

ments, they ought to reach perfection immediately, to have none of the defects of the old system, and that everything should work perfectly smoothly. But, as a matter of fact, in everything new that was introduced, every little thing that went wrong was immediately reported to the manager; and he was apt to think there were far more difficulties than with the old system, whereas the men had become used to the difficulties with the old plant, and managed to get over them." In a letter published in the "JOURNAL" for June 25, 1895, Mr. Herring concludes with these words: "I may, therefore, fully claim that the system has also survived in Huddersfield 'in the full sense of the term as used by evolutionists.'"

In the number of the "JOURNAL" for Nov. 19, 1895, there appeared an interesting account of a visit of the Editor to the gas-works at Huddersfield. In the photographic view published with the account of what he found on that visit, it will be seen that certain omissions mentioned in connection with our "inclines" were provided for in a substantial manner at the English works. The same is confirmed by the text of the article, in which the writer confirms any good opinion one may have acquired concerning the "slopers," through the reading of the papers, letters, or other communications previously published. Among these may be mentioned a paper by Mr. J. Husband, concerning the slopers at one of the works of the Brentford Gas Company, of which Mr. Frank Morris is the Engineer. This paper was read before the Incorporated Institution of Gas Engineers, May 8 and 9, 1895; * and in it Mr. Husband said that, after five years' operation, he was able to give reliable data concerning the working of the system. He does not merely say, he asserts, that in their perfected form "slopers" have "proved to be great reducers of hard, wearisome toil, and great economizers of time, labour, and capital." But the paper is so full of information on the subject, that those desirous of obtaining it ought to read the original.

In Germany, "slopers" have not as yet made much headway, mainly because of reasons which will presently be stated. Herr W. von Oechelhaeuser, the General Director of the German Continental Gas Company, who own a number of gas-works, and whose chief office is in Dessau, very kindly replied to an inquiry concerning the progress of these retorts in his country. He said he had personally followed, and on the spot, the development of inclined retorts, both in England and France; but, though he felt greatly interested in the subject, as the wages paid in Germany were not anything like so high as they were in America or in England, and as they never yet had strikes, the advantage economically considered, of the "inclines," appeared, under these conditions, unimportant. Hence he had not introduced the system at any of the works under his control.

The first bench of "inclines" introduced in Germany was at Stettin, in 1890. In the following year, four sets were put up at the city works of Berlin. At Dresden, two settings were tried; and the first experience was so encouraging that an additional number had since been erected. Herr Hasse, of Dresden, gave an account of results obtained with sloping retorts at the meeting of the German Association of Gas and Water Engineers held at Cologne in the summer of 1895; and he said that their producing capacity was greater than that of horizontals, per square foot of ground occupied, in the proportion of 5 : 4, and that the cost of manipulation was from one-third to one-half less for the slopers. "In consideration of the great importance of the question," wrote Herr von Oechelhaeuser, "the German Association then elected a Committee, who were to collect all information concerning the general experience with the system, and embody the same in a report to the Association at their next annual meeting (1896)." He also referred to the successful working of the "slopers" in Vienna. From Berlin, the Managing-Director of the city gas-works was so obliging as to send, in a letter dated April 21, 1896, a comprehensive statement of results with his "slopers." They use elliptical retorts and Silesian coals, with four-hour charges. The report as to the number of ovens has been stated before. The coal used seems to yield 4·51 cubic feet of gas per pound; the candle power not being given. The retorts at Berlin are quite short, compared with those in use elsewhere. The Manager said the results were not altogether satisfactory, inasmuch as the furnace did not heat the retorts evenly; but a new set had been erected, in which they were expected to be better.

I will now take up the well-authenticated results of the successful operation of the "slopers" at Vienna. On writing to Mr. Edward Drory, then the Chief Engineer of the Erdberg Gas-Works at Vienna, and since then promoted to Berlin, that gentleman was pleased to send very full information on the subject of his experience with inclined retorts. The works are one of a number owned by that great English corporation the Imperial Continental Gas Association. The information so generously sent came (though received from Mr. Drory) through the principal office of the Association just named, with full permission to publish it, and lay it before our Association. The corporation is not in business to erect gas-works for others, or to sell apparatus, and the sending of this information was, therefore, an act of disinterested kindness on the part of the officials, particularly of Mr. Drory. These gentlemen did not meet with success in their first trials with the "slopers." As they no doubt recognized the real practicability and advantage of this system of setting retorts, they were not discouraged; but eliminating the objectionable features as they found them, they improved upon the original Coze plan step by step, and now for some years, as we are most credibly informed, have operated the inclined retorts with entire success, and no doubt to the considerable financial advantage of their corporation.

Permit me at this point to quote (by permission) from a letter of Mr. J. B. Crockett, written March 31, 1896. He said:

I am very glad indeed to see you are going to take up the subject of inclined retorts once more. There is no question but that they are working them with great success at Vienna; and Mr. Edward Drory, the Superintendent of the works there, told me that they were so well satisfied and pleased with them that they were going to add ten benches more to their plant.* The ten benches in operation were working successfully, and seemed to be doing all that was claimed for them. I saw them draw the retorts; and they seemed to have no difficulty whatever either in getting the coke out or from accumulation of any tar. They had a sort of plug at the lower mouthpiece to prevent the coal running over; and they charged from a platform at the upper end of the bench, but in what I thought rather a crude way, and which could be improved upon very much, as they seemed to have three sets of buckets to take in the different lines of retorts, which I think could have been done with one just as easily.† They had a track extending over the end of the bench for some distance, and upon charging the upper retort would push that bucket back over the end of the track, and bring forward the second bucket to charge the middle retorts, then push that to the end of the track, and introduce the third bucket for charging the lower retorts—all of which seemed a useless way of doing it. They had an endless chain elevator, which carried the coal from the sheds, and dumped it into the hoppers at the end of the charging-platform, from which it was discharged into the buckets. That part of the apparatus was very good indeed. The saving of labour is very evident, although they had no cellar to dump the coke into, but took it out from under the retorts in ordinary wheelbarrows. This could also be done to better advantage by having a cellar, and putting a conveyor in, taking the coke out through a water-trough, and then to the storage bins. I have always believed with you that the inclined retorts could be made a success; and after seeing them work at Vienna, I was more than satisfied with it. Labour in Germany is cheap and plentiful, which accounts in a great measure for their not adopting more labour-saving machinery, such as we have in this country.

Thus far Mr. Crockett; and in connection with the last sentence, please remember what Herr von Ochelhaeuser said in his letter concerning the same subject—the condition of the labour question in Germany.

Under date of Feb. 19, 1896, Mr. Drory said: "The present satisfactory results I have only been able to obtain after three years of careful study and repeated improvements in the furnaces themselves and the apparatus." Mr. Drory then forwarded, through the general office of his Company in London, four sheets of drawings and a letter explaining same, together with some suggestions. He said:

I have only to direct your attention to the principal merits of the system, and to those points on which the success of a plant of "slopers" depend.

1. *Handling the Coal.*—Have a simple and strong coal crusher, every moving part of which can be repaired or exchanged within a few hours, and an elevator and conveyor to suit. Have coal-hoppers above and along the whole front of the furnaces, with a capacity of at least 24 hours; so that you are safe against any small breakdown in the machinery. I have not had one these four years. Having the coal everywhere near at hand, you are able to charge the retorts with an unrivalled speed. This is the principal reason of our great economy in labour.

2. *Construction of Retort-House.*—There is no expensive and large retort-house and costly roof, as necessary for horizontal retorts. You only want a very simple iron construction, in order to protect the furnaces against wind and rain, while all the work is to be done practically in the open air, which I have experienced to be a great advantage and comfort for the men. The retorts discharge the coke directly into the coke yard—no transport being necessary. In this way, large economies are realized in cost and area of retort-house, as well as in coke handling.

3. *Construction of Furnace.*—The furnace is a generator furnace of new and simple design. The setting is light and yet strong, and enables you to produce high and uniform heats by a minimum consumption of fuel. It is easy to control and regulate. We have already produced from 19,500 to 21,000 cubic feet of gas per retort per day (four-hour charges); and the fuel has not exceeded 11 per cent. on the coal carbonized. The retorts ought not to be much longer than 15 feet; otherwise the repair of small holes and cracks after scurfing will be difficult.‡

Upon the whole, I feel entitled to regard my system of "slopers" and retort-house in its present development as a complete success. After eight years of experience and continuous improvements, I may safely recommend it to my fellow-engineers as the cheapest and most efficient plant for the production of coal gas.

Appended to the paper were a number of tables showing the comparative cost of constructing and manipulating various kinds of retort-settings. These results are summarized in the

* See "JOURNAL," Vol. LXV., p. 1076.

* Since added. Mr. Crockett was there in August.—F. E.

† It was found best, according to Mr. Herring, to charge all retorts from a certain height (a little over 4 feet above the bottom of the top end of the sloping retort) which may account for the three sets of charging-buckets. —F. E.

‡ The latest installations in England, notably at Leeds, where, after a thorough previous investigation of other systems by the Corporation Gas Committee, the "slopers" were preferred, 28 settings of sevens or 196 retorts, 20 feet by 24½ by 13 in. ⏢ shape, were contracted for with the firm of Messrs. Little and Graham. Hence there the longer retorts seem to be in favour. —F. E.

No.	Method of Operation.	Nature and Number of Furnaces.	Comparative Cost of Construction.					Comparative Cost of Manipulation.				
			No. of Retorts Set.	Dimensions of Retorts. Length.	Approximate Daily Capacity of Retort.	Capital Outlay per Retort Set.	Capital Outlay per 1000 Cubic Feet Retort Capacity.	Average Total Capacity of Plant per Annum, or 200 Maximum Working Days.	Per Cent. of Fuel required per Coal Carbonized.	Total Annual Cost of Manipulation to Outlet of Retort House, Exclusive of Water, Taxes, Ground Rent, and Superintendence.	Cost per 1000 Cubic Feet for Manipulation only, with Exceptions as per Previous Column.	Total Economy Shown by the Use of "Slopers."
				Ft. In.	Cubic Feet.			Cubic Feet.				
1	"Slopers"	10 Drory furnaces (existing)	90	15 0	17,657	$821·27	$46·51	317,826,000	12·0	$10,303 27	3·24 cents.	..
2	"Slopers"	14 Drory furnaces (do.)	126	12 0	12,612	707·46	56·09	About the same.	12·0	13,864 20	4·36 ,,	$3,560·93 No. 1 over No. 2.
3	Hydraulic stokers	22 Hasse-Didier furnaces (do.)	198	9 6	8,026	723·85	90·18	,, ,,	12·0	23,529 94	7·40 ,,	$13,226·67
4	Hydraulic stokers	28 fire-bar furnaces (do.)	196	9 6	8,107	580·62	71·61	,, ,,	18·0	37,684 46	11·85 ,,	$27,381·19
5	Manual labour	22 Hasse-Didier furnaces (do.)	198	9 6	8,026	574·84	71·62	,, ,,	12·0	27,590 90	8·68 ,,	$17,287·63
6	Manual labour	28 fire-bar furnaces (do.)	196	9 6	8,107	388·69	47·94	,, ,,	18·0	41,409 84	13·02 ,,	$31,106·57
7	Manual labour (Western gas-works.)	50 fire-bar furnaces, three retorts each, ground-floor (do.)*	150	9 6	9,820	364·25	37·09	294,600,000	22·2	55,566 28	18·86 ,,	$21,505·80 Compared with 13.
8	Manual labour (Western gas-works.)	20 fire-bar furnaces, five retorts each, stage-floor (do.)	100	8 6	8,107	363·40	44·82	162,140,000	22·0	31,644 60	19·5 ,,	$13,003·62 Compared with 13.
9	Manual labour (Western gas-works.)	8 fire-bar furnaces, six retorts each, stage-floor	48	8 6	8,107	340·83	42·04	77,827,200	18·5	14,516 41	18·65 ,,	$5,575·93 Compared with 13.
10	Steam stoker (Large American gas-works.)	56 regenerator furnaces, eight retorts each, stage-floor	448	9 6	7,777·4	627·14	80·63	758,000,000	15·5	55,728 80	7·35 ,,	$14,143·30 Compared with 12.
11	Manual labour (Large American gas-works.)	56 regenerator furnaces, eight retorts each, stage-floor	448	9 6	7,777·4	522·23	67·14	758,000,000	15·5	69,928 00	9·22 ,,	$28,342·50 Compared with 12.
12	Hypothetical "slopers" (Large American gas-works.)	22 Drory "slopers" (cost estimated and Americanized)	198	15 0	19,141+	869·43	45·42	758,000,000	12·0	41,585 50	5·48 ,,	..
13	Coze "inclines"	8 Arndt-Coze furnaces, seven retorts each (operated a few weeks only).	56	10 10½	11,784	729·89	61·93	131,980,000 (Had they worked.)	12·0	15,260 16	11·56 ,,	(Not a success.)
14	"Slopers"	8 regenerator furnaces, seven retorts each, in England (hypothetical).	56	20 0	16,167+	501·83	31·04	181,070,400	8·0	8,069 24	4·45 ,,	.. Saving by 14.
15	Manual labour	20 regenerator furnaces, seven retorts each, in England (do.)	140	9 0	6,466·8	244·76	37·84	181,070,400	12·0	13,948 97	7·69 ,,	$5,879·73
16	Manual labour	12 fire-bar ground-floor furnaces, five Ω retorts each, 21 in. by 13 in.	60	8 3	6,000 (Annual ave'ge.)	220·00	36·66	69,600,000	26·0	14,934 00	24·56 ,,	..
17	Water gas	Lowe improved, one set. Generator, 13 ft. 6 in. by 6 ft.	..	..	348,000	15,850·00	45·54	69,600,000	..	3,851 00	5·53 ,,	(Cost of Material higher than coal gas.)
18	Hypothetical "slopers"	3 regenerator furnaces, Drory system, six retorts each.	18	15 0	19,141+	779·00	40·69	69,600,000	12·0	6,923 00	9·94 ,,	Saving $8,011·00 Compared with 16.

* One part of works only quoted.

NOTE.—All above are, or have been, in operation, excepting the "hypothetical" cases only. These are based on known, well-authenticated results, obtained elsewhere.—F. E.

above table. The author acknowledged his indebtedness to Mr. Edward Drory for the form in which the particulars were presented; and he offered the following remarks in regard to them:—

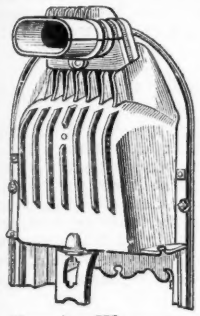
In the summary table, the first six lines contain Mr. Drory's figures. Lines 7, 8, and 9 contain facts and figures from my own experience, and with which I have been very familiar. Lines 10, 11, and 12 contain data concerning which a few explanations are necessary. In Mr. Drory's tables, there are some figures relating to mechanical stoking. As I have no figures (at least not at the date of writing this paper) showing at what cost "slopers" could be erected for now in this country, bearing in mind that the actual cost of these given, as put up in 1890, under the writer's supervision, was believed at that time to be too high, it was thought well to give a few facts about mechanical stoking. General A. Hickenlooper kindly caused the Superintendent of Manufacture of his Company (Mr. W. N. Miller) to prepare and forward the information used in the preparation of the data mentioned as relating to a "large American gas-works" (lines 10, 11, and 12). Mr. Miller gave full information upon all points asked for; and with the aid of these replies, the table concerning the large American gas-works was constructed. The writer does not know what the retort-benches or the retort-house cost; but these figures were supplied from actual bids on like work with which he is familiar. The author then constructed a hypothetical retort-house, put in the inclined retorts to produce the same quantity of gas from the same kind of coal, using as factors Mr. Drory's results per retort and his own experience as to the labour required and the cost of benches. The mechanical (steam) stoker requires a clear space of 16 feet between the mouthpieces and the wall of the retort-house; and as a labour-saver it may be relied upon down to five benches in operation, as compared with hand stoking and with horizontal retorts. Much of the saving at the large American gas-works is due to the admirable arrangements for handling coal and coke mechanically, and to the employing of regenerator furnaces; and Mr. Drory's statements in connection with the "slopers" may be remembered at this point. Line 13 gives the details as to actual cost and theoretical results (actual for a few days, however) had our installation of "inclines" been successful. Lines 14 and 15 give the hypothetical cost and results—for purposes of comparison merely—of gas made in England in sloping and horizontal retorts. The basis of the figures were obtained from the columns of the "JOURNAL OF GAS LIGHTING," at various times, and are only as near right as the author could make them with the data obtainable. They are not claimed to be absolutely correct, but only approximately so. Lines 16, 17, and 18 contain a comparative statement of results obtained with coal gas, water gas, and what might have been expected if "slopers" had been used to produce a like quantity of such gas at the same works. The cost of material has been omitted, because if you wish you can add that to suit your own locality.

In conclusion, the author would call attention also to the

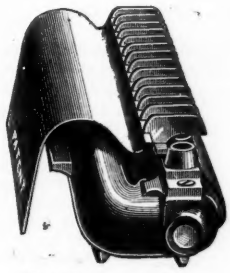
following: One of the arguments in favour of water gas has ever been its very much greater independence, on account of manual labour. Now, the "slopers" are not so economical as is water gas on that account; but they do go a very long way towards cheapening the manufacture of gas in retorts, and thus make it quite possible to enrich uncarburetted water gas, made in the ordinary generator, by means of rich cannel gas made in sloping retorts, instead of using oil, if that be more economical. That such a method is practicable, the writer has demonstrated to his own satisfaction; and he can safely assert that the mixture produced as fine an article of illuminating gas as he ever saw. Having taken up the subject of "Inclined Retorts" where we left it at our Savannah meeting six years ago, I hope that the present effort to bring "Inclined Retorts up to Date" may meet with approval.

FLETCHER, RUSSELL, AND CO.'S IMPROVEMENTS IN GAS HEATING APPLIANCES.

To anyone interested in gas, whether as consumer or gas-works official, a visit to the London show-rooms of Messrs. Fletcher, Russell, and Co. must always prove to be instructive. There may be seen, in orderly array, appliances of many kinds, showing the extensive use to which gas may be put otherwise than for lighting in the household and manufactory. In these appliances—although those which have been put on the market in the past have been found efficient and have met, as the demand shows, with the approval of the users—improvements are, through constant and persevering study, from time to time effected. In the "JOURNAL" some twelve months since, we noticed the new "register" gas-fires, with the open canopy, which the firm had at that time lately introduced; and it was then remarked that the close resemblance which these presented to the ordinary coal-fire would be a strong recommendation.



NEW AIR-WARMING ARRANGEMENT FOR GAS-FIRES.



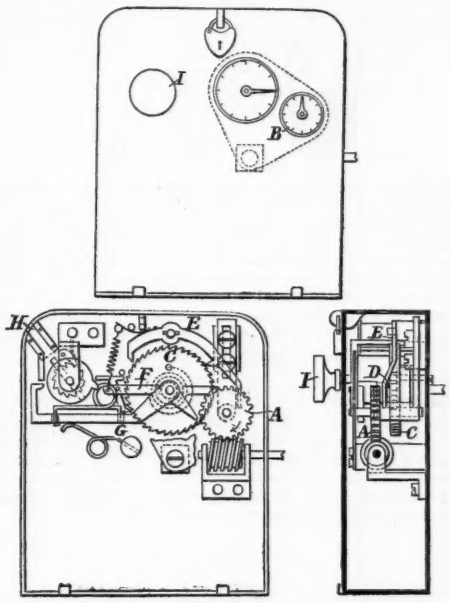
NON-LIGHTING-BACK BURNER, SHOWING SHIELD FOR ORDINARY FIRE-GRATES.

This has since been confirmed. Of this particular class of fire, new patterns have now been produced, bearing the names of the "Sumatra," "Senegal," and "Suez;" and these may now be had fitted with an air-warming arrangement, which utilizes the waste heat, and which, it is claimed, considerably enhances the duty. This device partly serves as the back of the fire, and is in the form of an iron box, ribbed on the fire-side surface. Another, but minor, change (which, however, assists in raising the heating value of the fires) consists in the provision of several pointed projections on the fire-brick back. The shapes and ornamentation of the stoves are entirely new; and they are all fitted with the firm's patent non-lighting back burner. Any one of them is sufficient for the heating of a room 20 feet square; and the maximum gas consumption, at 10-10ths pressure, is 27 cubic feet per hour. The new "Calcutta" fire embodies the same improvements as the foregoing. It is, however, cheaper and plainer than, but nevertheless equally as useful as, the "Suez," which is the least expensive of the three fires already named. Asbestos fibre fires are fast passing into disfavour; and the preference of the public is now almost entirely on the side of ball fires. In consequence of this, the popular fire called by Messrs. Fletcher, Russell, and Co. the "D2," which has hitherto been fitted with fibre, has now been adapted for ball fuel. Special attention has also been paid by the firm to the production of a suitable stove for use in shops, entrance halls, and such-like places where no flue exists. The result is a new type of reflector or "radiant" stove, the superiority of which over the older forms is, to say the least, remarkable. It is most powerful in its heating effect, and of cheerful appearance; but it is not recommended for use except in well-ventilated places, as, under an opposite condition, the stove—giving off a large proportion of warmed air—would create a feeling of closeness. In regard to the firm's non-lighting back burner, they have lately made one simple but important addition to it for use in ordinary fire grates with ball fuel. This is the provision of a shield over the mixing-chamber, to keep the hot fuel from contact with the latter; thus removing the only possible cause of lighting back in this particular burner. The reliability of the burner was fully demonstrated by some severe tests to which one was subjected in the presence of a representative of the "JOURNAL" on the occasion of a recent visit to Messrs. Fletcher, Russell, and Co.'s show-rooms. One other new and useful domestic appliance calls for notice. It is the firm's patent water-heater for baths, in which there are two specially prominent improvements. The first is that risk of explosion is done away with, as the gas cannot be turned on and lighted unless a pilot jet has previously been ignited, because the opening of the gas-tap turns the pilot light into position, and at the same time closes the opening, so as to prevent a taper being applied. The second is that, with a new safety water-tap, the risk of damage by the gas being ignited before the water is turned on is obviated, as the water and gas taps are connected in such a manner that it is impossible to light the gas until the water-tap is turned on. During the last eighteen months or so, the firm have also been doing a good and expanding business in their gas muffle furnaces, which are now used in many manufacturing processes. Experience has suggested certain improvements in their construction—one being the regulation of the heat to any desired degree by the provision of several burners independent of each other in place of one. In closing this notice of some of Messrs. Fletcher, Russell, and Co.'s latest improvements, it may be added that their new productions bear evidence of that careful workmanship for which they have long been reputed.

REGISTER OF PATENTS.

Prepayment Fluid Meters.—Webber, W., of New York. No. 19,049; Oct. 10, 1895. Date claimed for patent, under the International Convention, Aug. 8, 1895.

This invention relates to "a coin-controlled gas and liquid vending machine, designed to be attached to a gas or liquid meter, and constructed to cut off the flow of gas or liquid either by locking the meter or by operating a cock or valve in the service-pipe." The patentee employs a main wheel (which he terms a metric wheel), rotated constantly in one direction by the power of the meter when the gas or liquid is flowing, and of such size and so geared with the meter mechanism that a single revolution will permit the delivery of a coin's equivalent in gas. In connection with the metric wheel is a device which serves to lock the metric wheel always at a predetermined point in its revolution. This locking-device is arranged to release the metric wheel by the insertion of a proper coin in the machine, and is removed from its point of engagement with the metric wheel by a given space for each coin inserted at a single purchase, through which space it is tentatively returned to the starting-point, or to the position at which it locks the metric wheel, when the gas purchased has been consumed.



In the illustrations, A is the metric wheel, rotated exclusively in the direction of the arrow by the power of the meter. As shown, the wheel is connected with the meter mechanism by a worm on a shaft which reaches into the meter, and is geared to the so-called "two-foot" shaft, or to the usual index-worm. The metric wheel is journaled on a stationary shaft or stud, or it may be formed as a part of an adjustable plate, to permit interchangeable metric wheels of different sizes to be employed for adapting the machine to any change in the price of gas. The axis of the metric wheel has a pointer in front of the dial B, to show the amount of gas purchased and unconsumed, and provided with a stud or stop for locking the wheel (and also the meter) when the gas purchased has been consumed.

The locking and releasing mechanism comprises an escapement wheel or disc C, a stop arm or latch D secured to the disc; an escapement-pallet E; a lever F, pivoted on the shaft which carries the escapement disc; a starting pawl G, pivoted to the lever F in position to engage with the escapement-disc; and a spring applied to the escapement disc or shaft, so that it will constantly tend to turn the disc in the direction of the arrow. The escapement-pallet is extended to such an extent that the end of it reaches into the path of

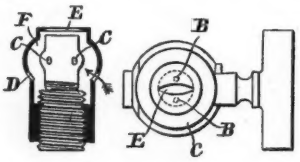
the stud on the metric wheel; so that the pallet will be operated once for every revolution of the wheel. The starting-pawl G is held in contact with a limit-pin by a spring; and the pawl is extended at its upper end, in position to be operated by a coin or other coin-controlled device which will act, first, to turn the pawl into engagement with the escapement-wheel, and, secondly, to depress the pawl and lever F, causing the pawl to turn the escapement-disc (in the direction opposite to the arrow) the space of one tooth. The arc traversed by the movement of the starting-pawl G, will duly withdraw it from contact with the coin, whereupon the spring will elevate it and the lever F to their original position. The movement of the escapement-disc C produced by the starting-pawl and coin, as described, will disengage the stop or latch D from the locking-stud on the metric wheel; and thus release it and the meter, and permit gas or liquid to flow. The tooth of the pallet E will retain the escapement-disc and stop or latch D in the position at which they were set by the starting-pawl—that is to say, so that the latch will clear the locking-stud of the metric wheel, until the pallet is operated by the impingement of the locking-stud against the extension of the pallet, whereupon the spring will return the escapement-disc to its original position, and reset the latch in the path of the locking-stud, to again lock the metric wheel and meter, when the former shall have made a complete revolution and a coin's value in gas has been consumed.

H is the external coin shoot. From this slot each coin is received within a recess, formed in a casing adapted to be revolved by a crank or knob I. The slot or recess is adapted to receive and retain a coin proper to the machine (and no other), in such manner that a portion of its edge will project a short distance from the casing; so that, by revolving the casing, the coin will strike upon the starting-pawl G, and effect the operation above described. After passing the projection of the starting-pawl, the coin will drop out of the slot into the main casing or cash-box below. If a coin smaller than the coin proper to the machine be dropped into the slot, it will be wholly enclosed in the casing; and hence will not operate the starting-pawl.

In case the machine is constructed to operate a reciprocating valve, suitable means are provided for converting the rotary motion of the shaft into reciprocating motion. Various means may be employed for this purpose, one of which would be to construct the shaft with an eccentric or cam to rotate within a yoke attached to the valve-rod, so that a slight turn of the shaft and eccentric would serve to open the valve and permit the flow of gas through the service-pipe.

Gas-Burners.—Gearing, E., of Harrogate. No. 21,757; Nov. 15, 1895.

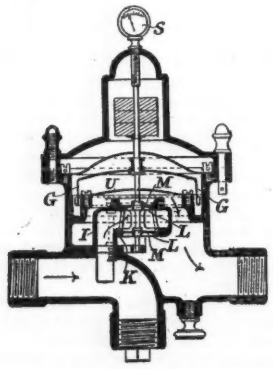
This is primarily a burner for acetylene gas, so as to obviate the trouble experienced from carbon deposits in the nipples of ordinary burners. The patentee proposes to construct the nipples with fine orifices (or an orifice or a slit) for the gas to flow through, combined with an outer cap or casing that encloses the nipple, but leaves a space between the two. It is constructed of thin metal, such as will readily acquire a high temperature.



The inner nipple, as shown in the engraving, is constructed with fine orifices B for the gas to flow through. The outer cap or casing is of thin metal—such as copper, bronze, or aluminium—with inlets D for the entrance of air, and with a slot or opening E through the top F. This cap encloses the nipple in such wise as to leave an annular space between the cap and the nipple. In some cases, lateral gas-orifices, as C, may be formed in the nipple, in addition to, or substitution for, those at the top. Air entering by the inlets flows upward within the annular space F, and meets gas escaping from the orifices of the nipple; the air and gas becoming mixed, and being burnt at the slot or opening E.

Gas-Regulators.—Tobler, A. C., of Paris. No. 23,046; Dec. 2, 1895.

This apparatus is principally "characterized by the disposition of conical clack-valves, ground in place, embodied with the stem in combination with a metal bell, of which the sides are conveniently folded over themselves, or furnished with a shoulder of metal, or of any other convenient material (such as gutta percha), in such a manner as to increase its buoyancy, and render its action more sensitive."



The body of the regulator, as shown in the engraving, is furnished with orifices for the entry and exit of the gas; and when placed above or upon the side of the meter, one or other of the inlets is closed by a screw-plug. Within the casing is arranged a metallic bell G (preferably of aluminium), the lower edge of which is turned up so as to form a trough immersed in a bath of mercury contained in an annular channel. Within the chamber a casting I is supported, into which is screwed a stem K, with orifices L arranged therethrough, and adapted to form seats for the valves M. These valves are conical, are ground on their seats, and are mounted upon the stem to which is attached the bell G. The upper part of the stem is furnished with a shoulder, on which rests a series of metal washers or weights; and the upper end is in contact with a spring lodged in the socket of a manometer S, mounted on the hood of the casing. A disc U, pierced with a central hole for the passage of the valve-stem and the gas, is disposed in the bell, and is fixed on the circular part of the casing which forms the trough for the mercury. A cover is also provided to close in the upper part of the body of the regulator.

When the gas enters, it tends to lift the bell G and the valves M, which movement closes the orifices L, and prevents the excess of supply of gas being communicated to the bell. Further, the action of the weights produces a downward pressure more or less in amount for the automatic regulation of the quantity of gas consumed. During the upward movement of the bell and the valves, the end of the vertical stem compresses the spring of the manometer, which, in turn, operates the indicating needle shown.

Producing Acetylene Gas.—Trouvé, G., of Paris. No. 23,521; Dec. 7, 1895.

This is a patent for "a generator of acetylene gas, comprising a stoppered vessel, apertured at bottom, immersed in water, and enclosing a suspended wire cage containing calcium carbide crystals, arranged in superposed layers separated by glass discs, whereby to cause the successive immersion of the layers, and ensure a uniform production of gas." The apparatus may be combined with a gasholder for the storage of the gas from one or more generators. The inventor also proposes a combination, in a portable lamp for burning acetylene gas, of means of generating the acetylene, and of two concentric and connected tubes—the one for conveying the gas to the burner, and the other being adapted to syphon off the water condensed in the gas-tube, and prevent it passing to the burner along with the gas. In such a portable lamp, with the generator there would be combined a surface condenser, formed of a spiral metal strip exposing a large surface, and enclosed in a box through which the gas must pass, so as to condense and collect the water carried off with the gas in its passage to the burner.

Keeping Gas-Engine Cylinders from Becoming Hot.—Lewis, J., of Leamington Spa.—No. 2171; Jan. 30, 1896.

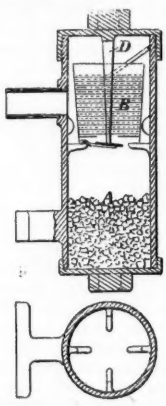
The patentee proposes to construct gas-engine cylinders with an outside jacket, which forms a complete chamber around the cylinder proper, or around the vessel or part likely to become unduly heated. Connected with the chamber at (preferably) the lower portion, are inlets to pipes or passages communicating with cool air either drawn or forced into the chamber so as to envelop the inner cylinder, and from whence it is continuously drawn or driven through another pipe, either into the open air or it may be used for heating or warming purposes. Valves and cocks are, of course, fitted in the passages, to regulate the supply and discharge of the air.

Gas Traction Cars.—Holt, H. P., of Chancery Lane, E.C. No. 4245; Feb. 25, 1896.

This invention relates to the engines and driving gear of a gas or oil traction car, of a kind especially adapted for narrow gauge; the arrangement of the parts being such that the car body is separable from the engine and gear, and its weight can be made to bear more or less on the driving-wheels.

Generating Acetylene Gas.—Clarke, W. C., of New York. No. 17,450; Aug. 7, 1896.

This invention relates to means by which water is brought into contact with carbide of calcium, until the chamber containing it is so far closed that no gas can escape until a valve is again opened and the contents of the water-vessel discharged.

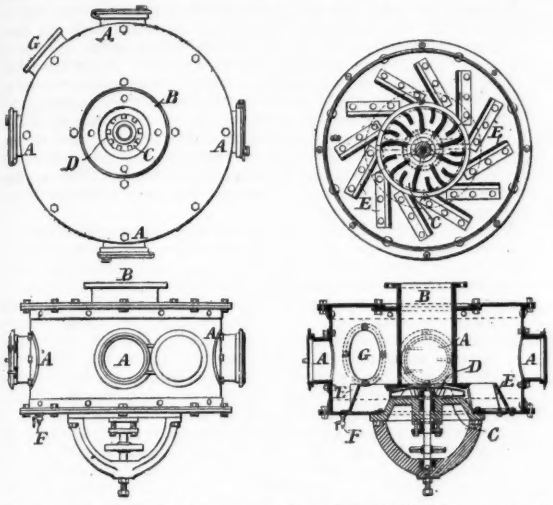


A is the generating chamber, consisting essentially of a vertical tube provided with upper and lower closing-caps. B is a water-vessel placed in the upper part of A, supported upon the projections shown. The vessel B is provided with a valve in the bottom, which is normally closed and water-tight. Attached to the cover is a prod D, which, when the cover is in position, projects downward into the chamber, and is of such length that, when the cover is in place, the prod will press against and open the valve. In using the device, the lower end of the chamber A is closed, and the charge of carbide to be used is

placed in the lower part; and the water-vessel B (containing a sufficient quantity of water to effect the decomposition of the carbide) is then placed in the upper part of it. The cover is then placed in position and screwed down until, when it is so far in place that any escape of gas is impossible, the prod D comes in contact with and opens the valve; whereupon the water is discharged from the vessel B upon the carbide in the chamber—effecting its decomposition and the consequent generation of gas. When the gaseous contents of the chamber are exhausted, or it is desired to renew the charge, the cover is unscrewed and the water-vessel removed. The lime resulting from the decomposition of the carbide is removed through the lower opening of the chamber.

Extracting Tar from Illuminating Gas.—Knapp, I. N., of Omaha, U.S.A. No. 17,729; Aug. 11, 1896.

The principal object of this invention is to remove the tar, entrained matter, and vapours that condense at ordinary temperatures from carburetted water gas, after the temperature of the gas has been reduced to about 125° by any appropriate means—this temperature being suitable for extracting tar and entrained matter. A considerable velocity is then imparted to the partially cooled gas, and to its tar and other entrained matter; so that "they move in a predetermined direction, and impinge upon fixed vanes or plates, which extract the tar and entrained matter, because the direction of motion of the globules and vesicles of the latter is not, by reason of their weight, readily changed, and because the gas escapes from and around the plates or vanes, by reason of the fact that the direction of its motion is readily changed."



In the engravings is shown a casing of cylindrical form, provided with hand-holes A, with cover-plates. B is an inlet that extends from the top of the casing downward through it to a point near its bottom. Beneath the bottom of the inlet is a centrifugal discharge wheel C. It comprises top and bottom plates, whereof the top one is provided with an opening D that communicates with the inlet, and is furnished with radial arms slightly curved at their outer ends, and of unequal length. The wheel is mounted upon a shaft revolvably supported by bearings and by an adjustable step-bolt carried by a yoke. E are a series of vanes or plates fixed to the casing, and arranged around the periphery of the wheel. They are disposed at an inclination to the radial position, as shown. F is a fluid off-take, and G is an outlet for clean gas.

In operation, the partially cooled gas enters at B, and passes through the opening D into the extracting-wheel C, which is rapidly revolved. The globules and vesicles of tar and entrained matter, as well as the carburetted water gas, are thrown off with considerable velocity from the periphery of the wheel by the rapidly moving arms, and impinge upon the fixed vanes or plates E. These rapidly moving globules "may not, by reason of their weight, change the direction of their motion suddenly. Consequently they impinge upon and adhere to, and flow or fall from, the vanes or plates, and thus escape from the gas current; whereas the carburetted water gas, being exceedingly mobile, changes the direction of its motion rapidly, and escapes from between the plates or vanes into the interior of the casing, from which it is collected by way of the outlet G." The tar and other matter extracted from the gas gradually accumulates at the bottom, from which it may be removed by way of the fluid off-take F, hand-holes A, or otherwise, as preferred.

Water-Meters.—Lux, F., of Ludwigshafen-on-the-Rhine. No. 17,992; Aug. 13, 1896.

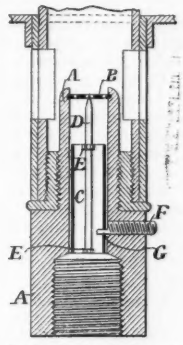
In his specification, the patentee remarks that the usual wing-wheel water-meters, by reason of their construction, present the fundamental objection that, so long as the water passing through them has not attained a certain quantity per unit of time, the meters will at first fail to indicate anything at all; whereas, upon the quantity of passing water having gradually risen to a certain value, they will indicate part only of this quantity, but they will not indicate the entire quantity of water until a still further increase has taken place. This error increases in proportion with the size of the meters; and therefore it becomes excessively great at times in the case of large-sized conduits. With a view to removing this objection, it has been proposed to provide in combination with a large water-meter a smaller one, arranged parallel to the former, and to provide (either directly in front or in the rear of the large meter) a valve so adjusted as to open only when the difference in the pressures acting on the front and rear sides reaches a certain predetermined limit. But in an arrangement of this kind, those quantities of water which correspond to a relatively small discharge in a given unit of time, will pass through the smaller meter; whereas the quantities which correspond to a relatively great discharge will pass through both the small and the large meter, and the quantity thus passing through the large meter will then be correctly registered by the latter. In the case of a medium discharge, however, when the valve is just barely opened, the quantities of water passing through the large meter will again be only partly measured, or not at all.

A perfectly correct operation, in a combination of the kind referred to, would be obtained only if the valve were made to open, not gradually, but suddenly, and at once to a sufficiently great width to make sure that the quantity of water passing in a given unit of time is large enough to be correctly measured by the large meter. To obtain this result is the object of the present invention; and it consists in transforming the usual combination valve (no matter whether the latter be a hydraulic valve or a spring valve) into what may be termed a "differential" valve—that is to say, a valve the equation of forces of which, when the valve is closed, will represent a higher value for the difference in pressure directly in front and in the rear of the valve when the valve is open.

Regulating the Admission of Gas to Incandescent Burners.—Gäbel, R., of Dresden. No. 18,283; Aug. 18, 1896.

This arrangement, by which the admission of gas into the gas and air mixing chamber of incandescent gas-burners is regulated, consists, essentially, of a needle joined to an adjustable slide, by means of which it may be introduced into, or withdrawn from, a hole in the nozzle connecting the mixing chamber with the gas-supply pipe.

The engraving shows the portion of the burner situated between the gas-supply pipe and the mixing chamber, with the regulating arrangement, in vertical section.

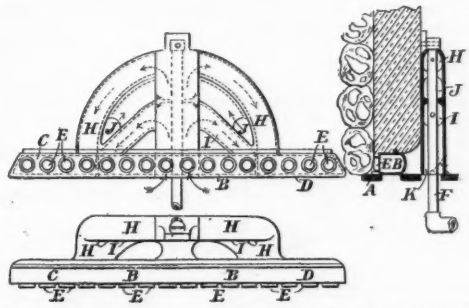


To the upper part of the body A of the nozzle is fixed a little sieve B, through which the gas entering from below passes into the mixing chamber arranged above. Underneath the sieve, a pin D, terminating conically at its upper end, is fastened to an adjustable slide C by means of "bridges" or connecting cross-pieces E, so that, when the slide is pushed up, the point of the needle enters the central orifice in the sieve.

The adjustment of the slide, in the arrangement shown, is effected by means of a regulating screw F, which is screwed through the side of the body of the nozzle, and by means of a pin or stud G, arranged in the form of an eccentric cam at its anterior end, gearing into a hole in the side of the slide. The other end (situated outside the body of the nozzle) of the screw F is provided with a slot, in order to turn it. The slide is thus moved up or down by the cam G, so that the needle will either close the central aperture in the sieve, or else throw it open and allow the gas to escape upwards.

Gas-Fires.—M'Caig, W., of Glasgow. No. 18,673; Aug. 24, 1896.

To overcome the defects experienced in some forms of gas-fires (attributable to insufficient pressure of gas and air supply to the extreme parts of the mixing chamber proper), the patentee proposes to construct the mixing chamber leading immediately to the burners with divisional chambers, and then lead independently to each of these, by means of separate vertically curved ducts or passages, the mixture of gas and air.

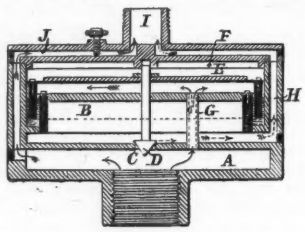


The mixing chamber A is constructed with a main central chamber B, and two separate side chambers C D. Leading from these chambers (which appear externally as one continuous chamber) are the gas jets or nozzles E, placed equidistantly from one another in the horizontal plane. The pipe F for supplying the burners with gas is enclosed by a vertical tube G, of larger diameter, into which the gas issues through the jets in communication with the bent tubes H I, which lead directly to the chambers B, C, and D respectively. The tubes H are isolated from I by a division or baffle plate, as shown in dotted lines. The curved bunsen tubes J supply the air, which rises in the tubes H; and the tube K (which is vertical, and constitutes

the downward termination of the vertical tube G) conducts the air up to the gas-jets, descending with the gas by the bent tubes I into the central chamber B.

Lighting and Extinguishing Gas-Lamps.—King, J. T.; a communication from the Connelly-Critchlow Company, of Pittsburg, U.S.A. No. 18,757; Aug. 25, 1896.

The object of this invention is to provide means for lighting and extinguishing gas-burners from a central point. The principle of operation of the device is that, in connection with the main burner is a supplemental constantly lighted gas-supply or jet, separate from, but adjacent to, the main jet. The main supply of gas to the burner is controlled by means of a valve with an automatic cut-off, operated by the pressure of the gas in the supply-pipe, and so constructed that, when subjected to the greater night pressure, the valve will open and admit gas to the burner; but when the pressure is reduced during the daytime, the valve will close so as to cut off the gas to the burner, but permit its flow to the supplemental constantly-burning jet.



In the line of the gas-supply pipe to a street-lamp, preferably at the top of the post, is placed the case of a cut-out device, having a chamber A communicating directly with the inlet-pipe, with a chamber B connected therewith by a port C, having a valve D which controls the port, and which is connected to a cup float situate in a chamber E; its lower edge being immersed in mercury contained in a circular groove. F is an air-vent in the chamber E above the diaphragm, to permit free motion of the latter. A passage G leads from the chamber A to the chamber below the cup-float, and a passage H leads from the chamber B in the wall of the case to the burner-supply passage I; and a bye-pass J leads from the inlet-pipe or chamber A to the passage I. A screw plug or valve in the bye-pass enables the size of its opening to be regulated, to permit the passage of any desired volume of gas.

The operation is as follows: The passage G connecting the chambers A B makes the gas pressure on the underside of the float always equal to the pressure in the supply-pipe. The float is weighted so that the day pressure of gas shall be insufficient to raise it and unseat the valve, but so that the increased night pressure shall raise the float somewhat and open the port C. During the day hours, the valve D is closed; but gas passes through the bye-pass J, and burns in a small jet adjusted once for all by proper setting of the screw shown. When the pressure in the main is raised to a degree sufficient to move the float, the valve will be unseated and the gas will pass through the port C and passage H to the burner, causing its full brilliancy. This will continue until the pressure in the main is reduced; and then the dropping of the float will seal the valve, cut off the flow of gas through C, and permit only the small jet of gas from the bye-pass to the burner.

APPLICATIONS FOR LETTERS PATENT.

23,723.—Taylor, T. C., and Tolson, J. E., "Retorts for carbonizing machines." Oct. 26.

23,727.—Hay, W. G., "Internal combustion engines." Oct. 26.

23,752.—Mackenzie, W. J., "Apparatus for generating acetylene gas." Oct. 26.

23,771.—Viggars, G., "Improved apparatus for heating and lighting purposes." Oct. 26.

23,776.—Prince, F. O'C., "Internal combustion motors." Oct. 26.

23,801.—Marks, G. C., "Burners." A communication from J. Gilbert. Oct. 26.

23,812.—Haddan, R., "Automatic production of acetylene gas." A communication from H. Colberg. Oct. 26.

23,857.—Hodkinson, J. & T., "Combined valves or taps and couplings for gas-fittings." Oct. 27.

23,877.—White, C. & T. H., "Automatic flash-light for incandescent and other burners." Oct. 27.

23,904.—Humphreys, A. C., and Glasgow, A. G., "Safety-devices for gas-producers." Oct. 27.

23,933.—Smith, W. B., "Atmospheric gas-burners, and the arrangement of incandescent material to be heated by them." Oct. 27.

23,976.—Chilton, H. H., "High-speed fluid-pressure and gas-engines." Oct. 28.

24,009.—Woodiwiss, G., "Atmospheric burners for incandescent gas-lamps." Oct. 28.

24,058.—Marsh, R. A., "Gas and oil motors for the propulsion of vehicles." Oct. 28.

24,064.—Crocker, S. H., "Mantles for incandescent light." Oct. 28.

24,091.—Dawes, J. T., "Internal combustion engines." Oct. 29.

24,110.—Richmond, J., Brennand, J., and Pedder, W., "Incandescent gas or oil burners for lighting and heating purposes." Oct. 29.

24,120.—Boult, A. J., "Production of acetylene gas." A communication from A. Vandenberghe and A. Gardeur. Oct. 29.

24,208.—Hughes, D. M., "Incandescence burners adapted for consuming oil gas." Oct. 30.

24,211.—Winther-Hansen, C. C., and Jensen, A., "Gas-engines." Oct. 30.

24,274.—Turr, R., "Production and combustion of acetylene gas." Oct. 30.

24,300.—Yates, H. J., trading as Arden Hill and Co., "Atmospheric gas-burners for stoves, and like heating apparatus." Oct. 31.

24,311.—Dawes, J. T., "Internal combustion engines." Oct. 31.

24,317.—Lane, D., "Gas-burners." Oct. 31.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

The Permanency of Illuminating Gas.

Sir,—I gather from Mr. Browne's letter, which appeared in your issue of the 27th ult., that his object in citing the phenomena at the Old Kent Road works was to prove that gas unsaturated with naphthalene sometimes deposited crystals and sometimes absorbed them; and that the varying factor in the case was moisture, which stood to the deposited crystals in the relation of cause and effect.

In my former letters, I have endeavoured to show that moisture had no more to do with the deposit of naphthalene crystals than the deposit of naphthalene crystals had with the condensation of moisture; and, as far as I can learn, the theory put forward regarding the interaction between aqueous and naphthalene vapour in the manner accepted by Mr. Browne, is founded upon no recognized physical law, but upon simple assertion, I believe, originally made by M. Brémond.

In my letter which appeared in your issue of the 6th ult., I explained how the phenomena observed at the Old Kent Road works were in perfect accordance with well-ascertained laws relating to the tension of vapours and their diffusion through gases—that, although it was quite true that the average relative temperatures and pressures of the gas entering the lime purifiers and leaving the meter were such as would enable the gas leaving the meter to hold in diffusion a larger volume of naphthalene vapour than in entering the lime purifiers, and that although it was also true that the gas sometimes deposited crystals of naphthalene in the meter outlet and sometimes absorbed them, yet that these results were entirely due to the chilling effects upon the gas of the cold oxide charged into the catch purifier leading to the lowering of the vapour tension of the naphthalene, and its consequent precipitation from the gas upon the cold oxide; such precipitated naphthalene being subsequently volatilized into the gas as the temperature of the oxide was raised, and so leading to the alternate denuding and supersaturating of the gas with naphthalene vapours—the supersaturated gas depositing crystals, the denuded gas absorbing them. The varying factor is the varying temperatures influencing the vapour tension of the naphthalene present in the gas.

Mr. Browne's principal objection to my method of explaining the results seems to be in the assumption that the gas enters the lime purifiers not only saturated with the vapours of naphthalene, but also holding naphthalene in an extremely fine state of division. Now, if Mr. Browne will give the matter a little thought, he will see that the same temperature conditions will bring about the same results (although in a modified degree), even though the gas enters the purifiers simply saturated with the vapours, without holding the naphthalene in mechanical suspense. Besides, seeing that Mr. Browne states that aqueous vapour present in gas in being condensed out separates in the finely-divided condition as a mist or fog, and that it also condenses as dew upon all surfaces colder than itself, and that he admits that he cannot see why naphthalene vapour should not be similarly precipitated as a mist or fog, Mr. Browne will surely also admit that a mist or fog can be carried forward in a current of gas for long distances. I cannot, therefore, see why he should object to my supposition that naphthalene is so carried forward by the gas into the purifiers.

Subsequently I will again refer to this subject. Meantime, however, let us assume that Mr. Browne succeeds in removing every trace of mechanically suspended naphthalene, and that the gas enters the lime purifiers simply charged to saturation-point with naphthalene vapour. Let us further assume that Mr. Browne is right in his inference that condensed water vapour is the cause of naphthalene being deposited. The gas will enter the purifiers at a temperature *slightly higher* than that of the atmosphere, and will be rapidly raised in temperature and take up moisture from the lime and purifier lutes, as described by Mr. Browne. Let us now suppose that the catch purifier has been freshly charged with oxide having *the same* temperature as the atmosphere. The gas from the lime purifiers, highly charged with aqueous vapour, on coming into contact with the cold oxide, will for a time have its temperature suddenly reduced—lowering the tension of the diffused aqueous vapour, and causing its condensation. According to Mr. Browne's theory, this would produce the most perfect conditions possible for the deposit of the diffused naphthalene in the crystalline form; and this deposition of the naphthalene would continue till the temperature of the oxide was raised sufficiently high to raise the vapour tension of the water and naphthalene that had been deposited, when they would gradually be revolatilized into the gas. We thus see that, whatever theory may be accepted, the explanation of the phenomena observed at the Old Kent Road works, of the alternate deposition and absorption of naphthalene, resolves itself into one of vapour tensions resulting from changes of temperature conditions leading to the alternate denuding and supersaturating of the gas with vapours—the gas during the saturating period depositing naphthalene, which is again reabsorbed by the denuded gas.

Mr. Browne concludes his letter by stating—apparently with the object of supporting his position—that the published results of his experiments on a working scale have been confirmed at the Mitcham Gas-Works; and that Mr. Green has found that half a gallon of hydrocarbon liquid per ton of coal will raise the illuminating power of the gas by one candle. This claim of Mr. Browne, however, sinks into insignificance when compared with that made in the concluding paragraph of a letter upon the same page of the "Journal" by Mr. Shadbolt, of Grantham, who claims, by means of what I may be allowed to call a modification of Mr. Browne's process—consisting of returning the partially purified gas holding in diffusion the lighter hydrocarbons derived from the coal alone, and without any added vapour whatever, back into the condensers—to be thereby able to produce 19-candle gas from coal which otherwise would only produce 16-candle gas, or an enrichment of about 3 candles.

Now, I have never questioned the results claimed to have been obtained by Mr. Browne. What I did was to suggest what appeared to me to be a possible explanation of how the enrichment was obtained—

to what cause it was due; and my object in referring to Mr. Shadbolt's process is to show that the results which he has obtained, and which he gave in the paper he recently contributed to the Eastern Counties Gas Association, strongly support my suggested explanation.

It has hitherto been a generally accepted belief that dry gas—that is, gas free from hydrocarbon vapours—could take up and hold in diffusion a larger quantity of hydrocarbon vapour than could gas already holding hydrocarbon vapours in diffusion. Both Mr. Browne and Mr. Shadbolt appear to hold a different opinion; for they both purposely add hydrocarbon vapour—the one the pure vapour, the other gas holding vapour in diffusion—to the gas in the condensers, with the view of increasing the power of the gas to take up in diffusion the hydrocarbon there present, believing that the presence of the lighter vapours has the power of raising the vapour tension of the denser hydrocarbons.

If Mr. Browne and Mr. Shadbolt are right in their beliefs, then it is evident that the hydrocarbons present in the condensers, which will have their vapour tension most easily raised to that which will enable them to be taken up in diffusion by the gas, will be those having the highest initial vapour tension—that is, that the light naphthas with the highest vapour tension should be the first to be taken up in diffusion, followed by the heavier naphthas and the denser hydrocarbons, in proportions gradually diminishing as their initial vapour tension fell.

If, on the other hand, the enrichment is due, not to the true diffusion of the hydrocarbon in the form of vapour through the gas, but to a physical condition leading to the suspension of the hydrocarbons in an extremely fine state of mechanical division—that is, in the form of an extremely fine mist—then those hydrocarbons which were present in the condensers in greater quantities, and which are most easily reduced to a state of mist, would be carried away in the current of gas in the greatest proportions.

Mr. Shadbolt in his paper gives the analysis of two samples of tars—the one, "A," being the tars produced in the condensers in the process of ordinary working; the other, "B," being tars produced in the condensers during the process of enrichment. The difference in the various products present in the two tars shows what was carried away by the current of gas to produce an enrichment of 1¼ candles.

Analysis of Tars.

Products.	Sample "A."	Sample "B."	Loss Due to Enrichment.
Water	1·90	1·74	..
Crude naphtha	8·10	7·57	0·53
Light oil	9·26	7·26	2·00
Creosote	25·57	22·00	3·57
Anthracene and heavy oil	21·48	19·35	2·13
Pitch	33·00	41·30	..
Loss	0·69	0·78	..
	100·00	100·00	8·23

It will be observed from the above analysis that the proportions of the hydrocarbon taken up from the tar and carried forward in the enriched gas bear no relation to their initial vapour tension; that while the crude naphtha with the highest vapour tension, and present in the condenser tar to the extent of 8·10 per cent., is only taken up by the gas to the extent of 0·53 per cent.; and that the other hydrocarbons with much lower vapour tension are taken up in much larger proportion—between six and seven times as much of the hydrocarbons usually associated with the creosote oil, and which have very low vapour tension, being taken up and carried away in the enriched gas.

I think that these results very strongly support my suggestion that the enriched gases resulting from such processes are not true gases, owing their increased illuminating power to the presence of hydrocarbons held in true gaseous diffusion, but are simply gaseous hydrocarbon mists; the enriching hydrocarbon being present in the gas in an extremely fine state of division, and which I fear will be liable to be precipitated during distribution—in short, is not a permanent gas.

From the way that Mr. Browne expresses himself regarding his conception of the extremely fine state of mechanical division which it is necessary for the hydrocarbons to assume to enable them to be thus carried forward in the current of gas, I am afraid that my use of the term "powder," for the finely-divided naphthalene deposited in the mains, has misled him. Vapours diffused through gas when condensed out of contact with solid surfaces, or on mechanical surfaces suspended in the gas, may assume very different grades, so to speak, of mechanical division. We have this fact beautifully illustrated in the aqueous vapour diffused through the air. When such moisture is deposited in an extremely fine state of division, it assumes the aspect of a blue haze; when the particles of condensed moisture are large, they become a white haze or cloud, and still larger, they become a mist; and when deposited upon finely-divided smoke particles, they become a fog. These particles, by coalescing, may be precipitated as rain, hail, hoar frost, or snow. Now, the hydrocarbons that are carried forward suspended mechanically in the current of gas are in these extremely fine states of division; and when I applied the term "powder," it was to the finely-divided particles of naphthalene that had cooled and been precipitated in the mains—which, in fact, had assumed the condition that Mr. Browne says some engineers had observed as granular deposits.

Mr. Browne's objection to my explanation of the thicker deposits of naphthalene at the bends and tees, I am afraid will not hold; for the simple reason that, before the naphthalene can act as a lagging, and delay the cooling, the naphthalene must be first deposited. Besides, Mr. Browne ignores the fact that the deposit is not wholly due to the cooling taking place at the surface of the bends or tees, but to the naphthalene which has been previously precipitated by the cooling action of the straight part of the main being carried forward in the current of gas, and impacted among the depositing naphthalene crystals at the bends and tees.

The subject of the permanency of illuminating gas involving the causes affecting the diffusion of hydrocarbon vapour through gas and those causing their precipitation, particularly of naphthalene, is one which I am sure deeply interests your readers; and personally it has been a pleasure to me to join in the discussion of these matters with Mr. Browne, who has evidently given the whole subject a large amount of attention and scientific thought. I shall wait with deep interest the further development of his process which he promises. Progress is frequently made by following a course which did not at first sight appear orthodox; and the results obtained by Mr. Browne may be due to causes of which we are unaware. As I have already said, no one will be better pleased than I to learn that Mr. Browne has made a discovery in gas manufacture likely to benefit all concerned, although that discovery should be the means of showing that my ideas were in error.

Priorsford, Peebles, Nov. 5, 1896. WM. YOUNG.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Nov. 3.

(*Before Mr. Justice* NORTH.)

Jervis v. Newcastle and Gateshead Water Company.

This was an action by the Trustees of the Pawson Estates, in Northumberland, to enforce an award made by Sir Jacob Wilson, fixing the price to be paid by the Company for certain land belonging to the plaintiffs.

Mr. BALFOUR BROWNE, Q.C., and Mr. HUGH BOYD appeared for the plaintiffs; Mr. SWINFEN EADY, Q.C., and Mr. METHOLD represented the defendants.

Mr. BOYD, after explaining that unfortunately his clients could not have the advantage of his leader's assistance that day, reminded his Lordship that the matter came before him in February last, on a motion by the Company to vary or send back the award; but, after some discussion, it was thought more convenient to try the questions in dispute in an action.* In 1894, the Company applied to Parliament for further powers to enlarge their works, and proposed, as part of the scheme, to take a house and about 60 acres of land belonging to the plaintiffs for the purpose of making a dam and reservoir. The Pawson Trustees opposed the Bill; and in the result a clause was inserted giving the Trustees power, within two years of the passing of the Act, to require the Company to take the whole of their estate, amounting to upwards of 5000 acres—their view being that it would be rendered nearly or entirely valueless if the house and adjoining meadow land were acquired. Acting under this power, the Trustees in December, 1894, served a written notice on the Company, requiring them to take the whole estate, but added a note saying that, without prejudice to the validity of the notice, if the Company within one month undertook in writing not to take any of the estate, the Trustees would apply to the Court for leave to release them from the effect of the notice. The defendants did not give such an undertaking, nor had they yet served any notice to treat. But, acting under the Trustees' notice, Arbitrators had been appointed, with Sir J. Wilson as Umpire; and in November last year, the latter made his award. In this he put down £40,139 as the price of the whole of the Trustees' interest in the estate; and a further sum of £8152 as compensation for the compulsory sale. The defendants were willing to pay the £40,000. They contended, however, first that the sale was not a compulsory purchase at all; and, secondly, that even if it were, the Umpire had no power to award compensation in respect thereof. These were the two points which the Court was now asked to decide.

After considerable argument,

MR. JUSTICE NORTH, in giving judgment, said he thought it very probable, as Mr. Boyd had suggested, that the intention of the parties and the Legislature was that the notice to be given by the Trustees was in the nature of a counter-notice, or conditional notice, that if the defendants took any part of their land they must take the whole of it. But the clause was not so worded, nor was the actual notice served by the Trustees. He therefore came to the conclusion that the property was not taken compulsorily. The second point, which was one of very large application, he did not think it was necessary to decide, nor was it really raised by the circumstances of the case. He did not consider an allowance for compulsory sale, in addition to the purchase-money for the Trustees' interest, was authorized by the 19th section of the Company's Act.

Saturday, Nov. 7.

(*Before Mr. Justice* KEKEWICH.)

In re the Hoylake and West Kirby Gas and Water Company, Limited.

This was a petition asking the Court to confirm resolutions for altering the Memorandum of Association, so as to enable the Company to supply electricity. The Company was incorporated in 1877, with a capital of £52,000 divided into 10,400 shares of £5 each, of which £17,000 was devoted to the gas undertaking, and the remainder formed the capital of the water undertaking. Since their incorporation, the Company had carried on business with considerable success. Special resolutions had been passed for altering the Memorandum of Association by adding power to carry on, at Hoylake, West Kirby, and elsewhere in the county of Cheshire, the business of an electric lighting company in all its branches, and, in particular, to construct, lay down, establish, fix, and carry out all necessary cables, wires, lights, accumulators, lamps, and works; to generate, accumulate, distribute, and supply electricity; to light cities, towns, streets, docks, markets, theatres, buildings, and places, both public and private; and to carry on the business of electricians, mechanical engineers, suppliers of electricity for the purpose of light, heat, motor power, or otherwise. The proposed extension was required to enable the Company to carry on business more efficiently, and to attain their main purpose by new and improved means.

His LORDSHIP, in sanctioning the alteration, suggested that the name of the Company should be altered.

Mr. LAWRENCE, Q.C., said the Company did not desire to make any

* See "JOURNAL," Vol. LXVII., p. 283.

alteration in the name, unless compelled to do so by Parliament. Of course, parliamentary power would have to be obtained before the Company could enter upon their new business; and it was not desirable to change the name until this had been done.

His LORDSHIP said that, in the event of parliamentary power being granted, the Company should apply to the Board of Trade within three months to alter the name.

Mr. LAWRENCE said the Company would give an undertaking to this effect.

BROMLEY COUNTY COURT.—Friday, Nov. 6.

(*Before His Honour Judge* EMDEN.)

Kirby v. Bromley Gas Company—An Important Point of Procedure.

This was an action brought by Dr. Kirby, of Bromley, to recover £35 from the Bromley Gas Company for damages sustained by his horse, in consequence, it was alleged, of the negligence of the Company in not properly filling up a trench which had been dug in Chatterton Road, in connection with the laying of gas-pipes.

Mr. CORNIE appeared for the plaintiff; Mr. L. COWARD represented the Company.

Mr. COWARD, at the outset, pointed out that the accident took place on the 19th of February, and that the Company had no communication from the plaintiff until the 10th of March. They then replied denying all liability; and from that time until the 16th of October, they did not hear another word. He (Mr. Coward) therefore contended that the case was covered by the Public Authorities Protection Act, by which proceedings had to be instituted within six months after the act complained of, or six months after the ceasing of the act, damage, or injury. The question, however, would be raised by the plaintiff's Counsel that this constituted a statutory defence, and came under the County Court rules, whereby five clear days' notice had to be given of a special defence; and, if so decided, he (Mr. Coward) applied for an extension of the time.

Mr. CORNIE contended that this constituted a statutory defence, inasmuch as without the statute it would be no defence, and that it also came within the provisions of the County Court Act. It was nothing, he said, but a statutory limitation.

His HONOUR questioned whether the words of the County Court Act were only meant to apply to the statutes known to everyone as statutory limitations.

Mr. CORNIE submitted that they applied to every statute which was in substance a statute of limitations; also that the plaintiff's case had been brought within the six months' period, inasmuch as the horse was still suffering from the injury.

His HONOUR said the words of the Act applied to the injury or damage done to the road, not to the horse. The wording was, he added, open to two or three constructions.

Mr. CORNIE argued that the damage extended from Feb. 19 until June 1.

Mr. COWARD contended that it was not a statutory defence; and he read the Company's letter, written to the plaintiff, denying liability, and stating that the horse appeared to have fallen down some eight or nine yards from the trench in the road. The trench was properly filled in and consolidated; and the Company denied any negligence. The Public Authorities Protection Act was, he stated, passed for the protection of those who had statutory and other public duties imposed upon them; and he submitted that it ought to be applied in the present case. It was not on the same footing as a statute of limitations.

His HONOUR, after hearing the arguments on both sides, said a point of very considerable importance had been raised, because it not only applied to the case before him but to many others. The whole question turned upon whether or not the Act referred to was to be considered a statute of limitations. He took a statute of limitations to be a statute limiting the time within which an action could be brought; and bearing in mind this definition, and also having regard to the wording of the County Court Act and the County Court rules as regarded a statutory defence, he thought it was clear that this must be held to be a statute of limitations—limiting the time within which an action could be brought. Therefore, in his opinion, it was such a statute as would come within the County Court rules, and one of which notice must be given. This being so, the question arose as to whether it was a case in which he should allow an extension of time. There could not be any doubt on this point; for, having regard to the facts, it was clear that there had been great delay on the part of the plaintiff. He therefore allowed an extension of the time within which the notice could be given.

The case was accordingly adjourned, and the plaintiff was allowed his costs; no opposition to this being raised by the defendants.

Claim for Disturbance in Laying Water-Pipes.

Before his Honour Judge Edge, at the Okehampton County Court, on the 26th ult., Samuel Pike, farmer, of Belstone, claimed £8 from the Okehampton District Council for damage done to his land in laying water-pipes through it. Mr. A. E. Dunn, for the plaintiff, said that in 1895 the Council proposed to carry out a scheme of water supply, and agreed to pay the plaintiff £4 for the disturbance caused by laying the pipes through some of his fields. When the work was commenced, the contractor discovered that the Council had not applied for permission to borrow the necessary money; and the work was stopped. The trenches were kept open for a long time, and plaintiff was unable to place cattle in the fields for fear of them falling into the holes. The Council, however, did not pay the plaintiff even the £4 agreed upon, and had paid nothing into Court. The plaintiff was called, and said the trenches remained open from August till January; and Mr. J. Newcombe, the sub-contractor, for the work, said he thought £8 a fair claim under the circumstances. Mr. Peter, who appeared for the defence, said he regretted that the case had not been settled out of Court. Mr. Samuel Hooper, the Surveyor to the District Council, explained that there was delay owing to the non-delivery of the pipes. His Honour gave judgment for the amount claimed, and said it was evident that the work took longer than was anticipated.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly Ordinary General Meeting of the proprietors in this Association was held at the Cannon Street Hotel, London, E.C., on Tuesday last, under the presidency of Mr. T. H. GOODWIN NEWTON.

The SECRETARY (Mr. R. W. Wilson) read the notice calling the meeting, and subsequently the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 30th of June last.

The following summary shows the results of the Association's operations during that period: The quantity of gas made in the half year ended the 30th of June last was 4503 million cubic feet; the quantity made in the corresponding half year of 1895 was 4347 million cubic feet—being an increase of 156 million cubic feet, or at the rate of 3·6 per cent. The total number of lights on the 30th of June last amounted to 2,381,174. At the close of the corresponding half year of 1895 the number of lights was 2,250,974, which gives an increase of 130,200, or at the rate of 5·78 per cent. The entire length of mains on the 30th of June last was 1855 miles; the length of mains laid on the 30th of June, 1895, was 1806 miles—an increase of 49 miles.

Although the above figures indicate that the business of the Association continues to grow in volume, the profit earned has not advanced, but for the half year under review exhibits a small decrease upon that of the corresponding period of last year.

The number of new consumers added since the 30th of June, 1895, amounts to nearly 19,000, or at the rate of over 11 per cent.—a proof that the Directors' efforts to popularize the use of gas are meeting with appreciation.

The success achieved has been effected by lowering the price of gas used for other purposes than lighting, by the introduction of prepayment meters, and generally by cultivating a class of business which previously attracted little attention; but although by these means the loss of revenue from large consumers who now use the electric light has been compensated for, the costs of production and distribution having slightly increased, the ratio of profit to working expenses has been diminished.

The values of both coke and tar exhibited satisfactory improvement during the half year under review; but this was more than counterbalanced by the increase in the cost of coal, and the decrease in the revenue derived from the sale or treatment of ammoniacal liquor.

The alterations and improvements required to maintain the works and mains in an efficient condition were made at a moderate outlay.

The Directors have sold land for which there was no further use at Aix-la-Chapelle and Amsterdam, and have purchased a small house and garden contiguous to their Haarlem works.

The Directors have to report having obtained a concession for the lighting of Teltow, a suburban Commune of Berlin, until 1946, and the prolongation of their contract with the Commune of Tempelhof, another suburb of Berlin, until the year 1948.

The Directors regret having to announce the death, on the 9th of September last, of Mr. Leonard George Drory, their Chief Engineer at Berlin, and formerly their Inspecting Engineer, who only retired on the 30th of June last, after rendering the Association valuable services for over 53 years.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 30th of June last. These have been duly audited; and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended the 30th of June last, and a bonus of 1 per cent., both payable, free of income-tax, on and after Tuesday, the 10th inst.

The CHAIRMAN, in moving the adoption of the report, stated that the absence of Mr. Pigou was accounted for by a telegram which they had received intimating that his doctor would not allow him to attend the meeting, in consequence of a severe cold. With respect to the manufacturing and distributing aspects of their business, the report stated that "the values of both coke and tar exhibited satisfactory improvement during the half year under review; but this was more than counterbalanced by the increase in the cost of coal and the decrease in the revenue derived from the sale or treatment of ammoniacal liquor." Or it might be put, comparing like things with like, that the increase in the value of coke was more than counterbalanced by the increase in the cost of coal; and that the decrease in the value of ammoniacal liquor—which was commonly observed, and which was due to agricultural depression—was not counterbalanced by the increase in the value of tar. On the point of residuals, he might state that gas makers on the eastern side of the North Sea had really to complain of the mismanagement of that great residual coke in this country. If people wanted to export coke, he did wish that they would choose a market where they could get a good price for it. He could tell them of one for a very moderate consideration. The following passage in the report he would especially call the consideration of the shareholders to: "The number of new consumers added since June 30, 1895, amounts to nearly 19,000, or at the rate of 11 per cent.—a proof that the Directors' efforts to popularize the use of gas are meeting with appreciation." This really meant that, if they lost on the next day any one station they had abroad, the number of consumers within three years would be the same as it was that day. He did not for a moment wish them to suppose that the consumption of gas would be the same, because the consumption was not now increasing in the same ratio; but he had every reason to think, from the fact that the increase in the number of consumers was accelerating, that this would go on. It arose, no doubt, from various causes, some of which might be present to their own minds, and others which he would not, perhaps, like to refer to. This was a matter that would keep for another occasion. With these remarks upon the manufacture and distribution of gas for the half year under review, the Chairman of an English gas company would have faithfully reflected the labours of the Directors for the period which had elapsed since the previous general meeting. But, as the proprietors were aware, the heavier duties and responsibilities

of their Directors only commenced at this point; and they expected from him all the information which could with common prudence be given upon the contracts entered into with municipalities, and the negotiations that might be in progress with them for the supply of gas, which contracts, in almost every instance, were the charters of the leasehold interests they possessed in their undertaking, as distinguished from the freehold interests of gas companies in this country. This information he was glad to have the opportunity of giving them, not only for the half year under review, but up to the last hour, with respect to Vienna, where their altered position was a subject on which the proprietors would naturally expect him to report. The duties and difficulties of the Directors had in recent years been intensified by the wave of misdirected municipal action which had spread over Europe. Yet he was glad to see that those who were really forward economists, began to recognize that the proper function of a municipality with respect to works of public supply was that of control, and not of exploitation. He desired to premise that they were never in a stronger position to meet the loss of an important station than they were in at this moment. He meant that, in his opinion, the net assets of the Association never exceeded in so high a proportion the nominal capital as they did at the present time. While the Board would give certain information with respect to the present position at Vienna, they must appeal to the proprietors not to press inquiries for further particulars which could not now be prudently given, and the answers to which—were they in the affirmative or the negative—might possibly be equally detrimental to the best interests of the Association. Even suggestions which some proprietors would like to offer might lose their value, if publicly made. He therefore asked them to reserve such suggestions for private expression to himself or the proper officer of the Association, when every attention would be paid to them. The one and only advantage the Association had in their negotiations with the municipal bodies, was that for a long series of years the proprietors had not demanded from the Directors foreshadowings of particular lines of policy which it was intended to follow. The position at Vienna was briefly this: The Association had three years—and, as the last three years, presumably the best three—of their 22 years' contract there yet unexpired; and the Anti-Semitic party in the Town Council had thrown away a golden opportunity which they had up to last Saturday of acquiring perfectly up-to-date works, and a complete system of mains, at a figure of certainly one-third of the sum they must expend to supplant them. The decision of the Town Council appeared incomprehensible; but he would ask them to observe what had been the past history of negotiations at Vienna. The Association had supplied gas to the City of Vienna since the year 1845, when a contract was concluded for 32 years—that was, until 1877. Three years before this date—in 1874—the question was raised by the Vienna Town Council whether the Municipality should not undertake the supply of gas themselves; and it was eventually decided, as it had been now, to do so. A site was bought for the town works, a manager was appointed, plans were prepared, and matters were progressing towards the execution of this decision, when the Association came to an arrangement with the authorities, twenty months before the expiration of the contract, for its extension until 1899. This arrangement included a reduction in the price of gas, with power for the town to terminate the contract, with notice, in 1889. In 1885, the Town Council again raised the question of municipal works, and decided not only to build, as they had done again, but also to decline any negotiations with the Association. Nevertheless, the Association were able to offer such favourable terms to the Municipality—terms which again included a reduction in the price of private and public lighting—that the Town Council eventually rescinded their decision to build, and did not give the notice to terminate the contract. In 1892, long before any proprietor raised a question on the matter, the Board made advantageous proposals to the town for a prolongation of this contract with the Association; for it must not be forgotten that the Association claimed to have more than thirty contracts with suburbs of Vienna, expiring at various dates up to 1920. But "Municipal gas-works" became the rallying cry of the Anti-Semitic party, which had been gaining force for years in the Town Council; and eighteen months before they were entitled to do so, the Council wished to take in hand the preliminary valuation of the Association works, prescribed by the contract. To this the Association consented, in order that there might be no question of hurrying the decision of the town. Those who had followed Austrian politics in general, and those of Vienna in particular, would know that from May, 1895, to May, 1896, Vienna was without representative Government. Then the Town Council was elected; and since that time, a Gas Commission had been appointed by the Town Council. The Commission had only reported within the last fortnight, with the result that on the 28th ult. information was received from Vienna that the Town Council had, by 94 votes to 33, resolved to build town works. Allusion was made by Dr. Lueger, who was the leader of the Anti-Semitic party, at the close of a three days' heated debate, which occupied the Vienna Town Council last week and the week before, to a recent offer by the Association to the Town Council, the history of which the proprietors should know. A fortnight ago the Gas Commission asked the representatives of the Association there for an offer on an entirely new basis. Speaking broadly, it was for what sum of money the Association would clear out of Vienna on January 1 next. Ever ready to meet the wishes of the Town Council, with due regard to the proprietors' interests, a calculation was made—not, of course, on the basis of the position in which they stood up to Saturday, with their hands tied behind them, but in the position of greater freedom in which they now stood; and a sum was named, accompanied by the remark that if the Gas Commission considered the Association's terms too high, they could make a counter proposal. This, however, they declined to do. Those conversant with gas affairs, would know that such a sum was apparently a large one. It was, in fact, 35,000,000 florins, which was equal to about £2,920,000 in our money; and this had had no other effect at present, than to form a peg on which Dr. Lueger could hang his invective. If the view of any proprietor was one of regret that the Town Council had passed a resolution to build works, he should remember that the Directors were powerless to prevent it. The argument of the Liberal party in the Council, the opinion of their technical advisers, and the wish of the consumers, as testified by the petitions of 42 of the organized trade guilds of Vienna, who were aware that the Association had offered to supply gas at a cheaper price than could be done from the proposed Municipal works—all this availed nothing with the Anti-Semitic majority of the Town Council to prevent the resolution to build from being taken on strictly party lines. He had referred to the past history of negotiations at Vienna; but he was unwilling in any way to suggest that history would repeat itself. If the Town Council carried out their resolution to build—and he was bound to tell them they were taking some preliminary steps to do so, as the Directors had that day heard—the Board would have to reconsider their policy, and, he hoped, with the calmness which befitted the occasion, and which he could not too strongly recommend to the proprietors as the only attitude they could adopt which could aid the Board at the present juncture.

Mr. J. HORSLEY PALMER seconded the motion.

The CHAIRMAN, in reply to questions put by various proprietors, said that some of those asked certainly came outside the limits which he had prescribed, and therefore to answer them would not be to the interest of the Association. As regarded Mr. Horncastle's inquiry, he thought that this gentleman must be referring to the state of things which prevailed in the interregnum of last year, when an Imperial Commissary was appointed. Of course, if the Municipality of Vienna wanted to borrow money, they would have to go to the Diet for power to do so. At the present moment they had power to borrow 30,000,000 florins. Mr. Drew's question was, he thought, concretely answered in this way—that the Association's contract with the Central Commune of Vienna referred to both public and private lighting. The amount of reserve at the present moment was £382,000, invested in Consols. He could not answer the question as to the value of the Vienna contract to the Association. All he could say was that on the advice they received as to what their position would be on Jan. 1 next, they felt perfectly justified in asking 35,000,000 florins (or about £2,920,000) to go out. The electric light was quite a distinct thing from the contract with the Municipality. It was a contract with the Government, and it did not expire until 1908. As to the lighting in the Communes, they maintained that the Commune of Vienna could not annul the Association's contracts with such of the Communes as had been incorporated with the Central Commune of Vienna. When he said "could not be annulled," he meant with justice; and he believed they would have justice in Vienna.

He then put the motion, which was carried unanimously.

The CHAIRMAN next proposed the payment, free of income-tax, on and after the 10th inst., of a dividend of 5 per cent. for the half year ended June 30 last, and a bonus of 1 per cent. on the £3,800,000 stock of the Association.

Mr. BASSETT seconded the motion, which was agreed to.

The CHAIRMAN afterwards proposed a vote of thanks to the officers at home and abroad; and he desired on this occasion especially to mention Mr. Lindon and Dr. Teltscher, their representatives at Vienna, who had had to suffer most unmerited abuse.

Colonel WILKINSON seconded the motion, which was carried unanimously.

Mr. DREW afterwards proposed a vote of thanks to the Chairman and Directors, who, he had no doubt, had recently experienced a very anxious time. It was only those who were behind the scenes, who knew the difficulties they had had to contend against.

Mr. G. BARRETT seconded the motion, which was carried unanimously.

The CHAIRMAN, in acknowledging the vote, assured them that, without stating too much, it was not undeserved; for they had had a very anxious time, and there was no doubt that for some while to come they would have a similar experience. The proprietors' recognition of this was a reward which he was quite sure none of the Directors would fail to appreciate.

The proceedings then terminated.

COLONIAL GAS ASSOCIATION, LIMITED.

The Annual Meeting of this Association was held last Tuesday, at the London Offices, St. Clement's House, Clement's Lane, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. A. J. Kingdon) read the notice convening the meeting.

The CHAIRMAN said, before commencing the ordinary proceedings, he wished to mention, with great regret, the loss the Association had sustained through the death of their late Secretary (Mr. G. J. Gray), which was caused by a street accident. He was sure the shareholders would concur in the vote of condolence which the Directors had forwarded to Mr. Gray's family, and in which they deplored the loss of a most valuable and efficient Secretary. For the purposes of performing the work connected with the meeting, and sending out the dividend warrants, it had been necessary to appoint a Secretary *pro tem.*; and the Directors had that day asked Mr. Kingdon to undertake the duties. Continuing, the Chairman moved the adoption of the report and accounts (see *ante*, p. 857). In doing so, he said he was sorry the progress of the Association during the past year, had not reached the expectations of the Board, as Australia—especially Victoria, where nearly all the works of the Association were situated—was still suffering from the effects of the terrible depression of four years ago. The result was they were practically keeping nearly level; but the Manager (Mr. G. Swinburne) was practising every possible economy. It would be seen that the figures in the accounts worked out to about the same as in the previous year; and that, with the interim dividend and that now recommended, the dividend for the year would be 2½ per cent. This to the Directors, as well as to the shareholders, was not so satisfactory as could be wished, nor was it such a percentage as a foreign gas company should pay. It was, however, under the circumstances mentioned, as much as they could afford. As usual, Mr. Swinburne had sent them a very full report. He certified that the works were in good order, and was sanguine that the Association had a brighter future. In confirmation of this, he (Mr. Spencer) would like to mention that the Chairman of a large and old-established

business in Melbourne, in addressing a meeting of his shareholders in London last week, said "he was glad to say that the prospects looked brighter than for four years past, and that the spending power of the community seemed to be greatly increasing." If this desirable condition of returning prosperity was fulfilled, the Association would soon begin to feel the result; and to none would the pleasure be greater than to the management both in London and the Colony, as they would, with every confidence, feel certain of gradually attaining the old rate of dividend. At the last meeting, it was stated that the opportunity had presented itself of extending the operations of the Association; and since then the Directors had secured a concession for lighting the town of Geraldton—a rising seaport in Western Australia. Nearly the whole of the plant had been sent out; and the Directors hoped to hear, in the course of the next five or six months, that the works would be ready to supply gas. Mr. Swinburne had the greatest confidence in saying that this undertaking would turn out well; and he (the Chairman) might add that Perth—the next town to it—was supplied with gas by a Company who were earning something like 15 per cent. on their capital, and were now considerably increasing their business. The Board had arranged with Mr. Swinburne that, in the event of their not being able to provide all the capital required for Geraldton, they should take up two-thirds of the capital in London, and leave one-third for the residents to subscribe. The cost, it was expected, would be from £6000 to £7000; and towards this they had received some £3000. There was a balance of about £1500 to be applied for; and he thought the 5 per cent. debentures offered must commend themselves to the shareholders as a sound investment, seeing that the total issue would then be only about one-fourth of the ordinary paid-up shares. The figures in the net revenue account showed that, after paying the proposed dividend, they would have a balance of £369, which was £155 more than last year.

Mr. G. H. Haywood seconded the motion.

Mr. Dyer inquired the amount of capital employed per ton of coal carbonized. The gas-rental for the ten existing works appeared to him to be exceedingly small; and he should like to know the price charged for gas. He also inquired whether there was any possibility of pushing the use of gas cooking-stoves, in order to create a day consumption. So far as he could understand the balance-sheet, they seemed to be somewhat over-capitalized. He had no doubt the Association would be prosperous in the future, and that the Directors were doing their utmost to make it a success.

Mr. Saward asked if the electric light was making any progress in their districts of supply; and also whether anything was being done in regard to incandescent gas lighting.

The Chairman said, owing to the unfortunate death of Mr. Gray, he could not offhand go into the financial questions in anything like detail. Generally, he was inclined to think the Association was over-capitalized. But it must be remembered that they were carrying on their operations in a distant country; so that they could make no comparison with English concerns. The price of their gas ran from about 6s. 8d. to 12s. 9d. per 1000 cubic feet, which was, of course, high. The reductions amounting to 1s. 3d. and 1s. 6d. which they made in the price some two years ago, in order to compete with kerosene, had since been a drawback to the production of a favourable balance-sheet. They were now, however, on a good bed-rock; and he anticipated that they would begin to reap the reward of these reductions. Cooking-stoves were not in much demand; the price of gas making it almost prohibitive as a fuel. Electric lighting did not trouble them; but in regard to incandescent gas lighting, they were in a worse position than another Company with which he was connected—the Singapore—the customers of which had to pay 3s. or 4s. for mantles. In Australia, the charge was something like double. The agency for that part of the globe was held, through the Austrian Incandescent Light Company, in London; and Messrs. Möeller and Fonblanque, of the English Company, had written to the Austrian Company on the subject, pointing out that their policy, if pursued, would prevent the extension of incandescent gas lighting in Australia. Replying to Mr. Curry, the Chairman added that he wished to convey by his statement as to the Company being over-capitalized, that it was so in proportion to the business.

Mr. W. C. Parkinson thought the Chairman's remark as to the Association being over-capitalized required a little explanation. If by that was meant that the capital had been watered, that was not so, because they had, through Mr. Coates and those associated with him, practically built most of the works themselves. If, however, it was meant that the works had been put up a few years ago in the anticipation of a gradual increase; that bad times had come upon them, and the increase had not yet taken place; and that the works were in some respects larger than was absolutely necessary for their present needs—then, in that sense, it was possible it might be so. The main point about the Association was that they had fallen, generally speaking, upon evil times in Australia, and had suffered; but nothing like so much as a large number of other gas companies. Take, for instance, the published accounts of the largest Gas Company in Australia—the Melbourne. They had reduced their dividend from 17 or 18 per cent. to 7 or 8 per cent.; and they were making considerably less gas than a few years ago. With regard to the new works at Geraldton, it would be practically impossible to put up gas-works in Australia at a less cost than they had been able to do in this case. Of course, they could not be constructed there at the same cost as in England, because there was the carriage on the materials, and skilled labour was more expensive. Mr. Swinburne anticipated that from the commencement of the business at Geraldton, the works would pay.

The motion was unanimously carried.

A dividend at the rate of 3 per cent. per annum having been declared for the second half of the year,

The retiring Directors (Messrs. G. H. Haywood and J. Coates) and the Auditors (Messrs. Alfred Lass, Wood, and Co.) were re-elected.

The usual complimentary votes to the Chairman and Directors, also to Mr. Swinburne and to the Australian Committee, terminated the proceedings.

New Water-Works for Larne.—The Larne Town Commissioners have accepted a tender of Messrs. Heggarty and Gault for carrying out some new water-works, at a cost of £3103.

GAS SUPPLY OF VIENNA.

The Projected Municipal Gas Undertaking.

It was stated in the "Journal" last week that the Vienna Municipality had decided, by a large majority, to build their own gas-works, in preference to renewing the concession to the Imperial Continental Gas Association, which expires in 1899. The following translation of an article in our Vienna contemporary "Der Bautechniker" will be read with interest in connection with the above decision:—

"The recommendations of the Town Council were adopted on the 27th of October by the Common Council of the city, after a discussion extending over three sittings. It now behoves our technical and industrial men to show that they can execute the proposed works within the given time. If no obstacles are placed in their way, there is no doubt they can do so. The price asked by the Imperial Continental Gas Association for the old works and mains, with the necessary improvements, is 35,000,000 fl. (about £2,917,000), which, even after deduction of the special sum of 3,000,000 fl. (£250,000) for meters, stores, &c., is so exorbitant a value that the rejection of their offer is amply warranted. Experts on oath valued the works, &c., at 16,000,000 fl. (£1,334,000). We hope that the town administration will make full use against the Imperial Continental Gas Association of the powers of direction and control which the current contract vests in the community. The threat of legal proceedings is of no moment, as a new method of oral legal procedure comes into operation on Jan. 1, 1898. Our contention goes even farther. We regard the existence of the works of the Imperial Continental Gas Association as a sure earnest of the safe execution of the town gas-works. The obligation to light the public streets and spaces is not, in our opinion, a private but a public matter; and if, for example, the Municipality have not constructed gas-works by Oct. 31, 1899, the State officials need not be perturbed. The Imperial Continental Gas Association must continue to deliver gas, or an official sequestrator will be put in to manage the works. But the price arranged under the expired contract will no longer be in force; and, if no agreement is come to, the charge will be settled by experts. Should the latter fix a price bearing the same ratio to the present as their valuation of the works bears to that of the Association, the community will not suffer."

From another source ("Der Gastechniker"), we give the recommendations referred to above. They are as follows:—

1.—The Municipality is to make no use of the purchasing powers given it by section 4 of its contract of May 22, 1875, with the Imperial Continental Gas Association.

2.—The erection of town gas-works on the lines of a general scheme by the Engineer Theodore Hermann, and the laying of mains throughout the town, are to be agreed to; and the required works are to be proceeded with forthwith.

3.—Every provision, both for public and private lighting in Vienna, is to be made by carrying out the necessary works in such time and manner that the public lighting can commence on the expiration of the obligation of the Imperial Continental Gas Association.

4.—For the works mentioned in recommendations 2 and 3, a maximum amount of 30,000,000 florins (£2,500,000) is to be granted.

5.—The Town Council is to make certain arrangements for providing the necessary funds for the work.

6.—A Committee for superintending the construction of the works above mentioned is to be appointed by the Common Council.

OIL-GAS ENRICHMENT COMPANY, LIMITED.

The Third Annual General Meeting of this Company was held in Edinburgh on the 29th ult.—Mr. G. Beilby in the chair.

The Secretary (Mr. J. G. Mason) having read the notice convening the meeting, the report of the Directors, the principal portions of which were given in the "Journal" for the 27th ult., was taken as read.

The Chairman, in moving the adoption of the report, remarked that though the work of the Company had been comparatively quiet during the year, there had been some steady progress in the actual business. Among the gas-works which had adopted the Peebles process during the past fifteen months were the Lennoxtown, Huyton and Roby, Chorley, and Bournemouth; and it had also been taken up by the Falkirk and the Paisley Gas Commissioners. In the case of Bournemouth and Paisley, the necessary plant was in course of erection, and would shortly be in operation; in the others, it had been at work for some time. He thought, in view of the fact that cannel coal had been steadily going down in price, or remaining at an extremely low rate, and that shale oils, which had hitherto been used as a means of enrichment, had continued to rise in price, the shareholders must be fairly well satisfied with the business done. At the meeting last year, he thought some remarks were made as to the probably increasing use of low-grade oils, such as blast-furnace oils, for making gas by the Peebles process. The shareholders would be interested and gratified to learn that an increased use of this oil was taking place, and with very satisfactory and economical results; so that any fears they might naturally have had a year ago that the rise in the price of shale oils would interfere with the business of the Company, had turned out to be groundless. The Directors had had before them the suggestion made at last annual meeting as to the appointment of a practical man to advise as to the working of the process in the various gas-works in Scotland; and they had been able to make satisfactory arrangements. There was another point in connection with the report to which it was well to call attention, and it was that, while the balance-sheet was for a period of fifteen months, it included practically only the royalties for twelve months. In other words, the revenue of one year had enabled the Directors to pay fifteen months' dividend. The results had been gained by twelve months' working.

Mr. R. Sanderson asked in regard to an item among the liabilities in the balance-sheet, whether the commuted royalties had been divided as revenue, or whether the money had been invested.

The SECRETARY replied that what had been done was this: The commuted royalties received during the period covered by the report had been carried to a special account in the Company's books. The Company's patents had a little over eleven years to run; and, in calculating the profits of this year, credit had only been taken for one-eleventh of those royalties. The question as to how they were to be dealt with in future was under the consideration of the Directors, and would be definitely disposed of by them before the next balance came round. But, as he had already said, on the present occasion they had only credit taken for one-eleventh. In regard to the question of investment, the balance of the money left, after certain necessary payments had been made, had been lodged with the Union Bank of Scotland.

The report was adopted.

GAS LIGHTING AND HEATING APPLIANCES AT THE BREWERS' EXHIBITION.

The Brewers' Exhibition which was held at the Agricultural Hall, Islington, last week, will be memorable, as far as people interested in gas lighting are concerned, for the unusually effective display of incandescent gas-burners presented to the visitors. The aim of the publican is to have his establishment attractively—even brilliantly—lighted; and his inspection of the various stands at the exhibition must have convinced him that this can be done without any very material disturbance of his existing gas-fittings.

On entering the hall from Islington Green, the first stall to attract notice was that of the Incandescent Gas Company, which, as before, occupied a central position at the end of the arcade. Here was tastefully displayed, beneath hanging baskets of ferns, a fine show of appliances and fittings suitable for the Company's system of lighting; and they received a large share of attention. Passing into the hall, it was at once seen that good use had been made of incandescent gas-burners—placed singly or arranged in clusters or rows—in lighting many of the stands. Coloured frosted globes of varied hues softened the light and added to the effect. At one stand, a novelty, in the shape of a combined globe and chimney, was shown, for which the important advantages were claimed by the proprietor (Mr. J. Ormerod) that it not only abolished smoke, but reduced by 50 per cent. the heat given off by the gas, and saved 25 per cent. in the consumption. Certainly the claim seemed to be borne out by the absence of discoloration of a strip of white cardboard under which the lamps shown were burning. At the same stand, the Globe Gas Enricher Syndicate had in operation a working model of their apparatus, with which they were getting with a No. 1 burner the light yielded by a No. 4. This system can be employed, independently of ordinary gas-works, for lighting country houses. At another stand, visitors had an opportunity of witnessing the extraordinary powers of the "Holophane" globes in increasing and diffusing light; and at another, they were shown how the incandescent or any other system of gas-lighting could be actuated and controlled from a central point by means of the electric attachments of the House and Street Electric Gas Lighting Company. This is an important matter for publicans who use the incandescent system for outside lighting. At the stand of Rollason's Wind Motor Company, Limited, there was a display of "New Sunlight" incandescent burners, the warm colour of which afforded an agreeable contrast to the paler light of the Welsbach burners. The stall of the American Incandescent Gas Lighting Company was a perfect blaze of light; a smaller show being furnished by the Star Incandescent Gas-Light Company. The "Surprise" pendants, and other fittings for incandescent burners, were to be seen at the stall of Messrs. O'Brien, Thomas, and Co. Of course, as in previous years, regenerative lamps were employed for lighting certain stands; and, on the whole, they were effective.

With respect to heating and cooking appliances, the Davis Gas-Stove Company, Limited, had a fine show of stoves, grillers, hot-plates, &c.; and Messrs. Richmond and Co., Limited, and Messrs. John Wright and Co., Limited, had attractive displays of their various classes of goods. A very fine collection of gas heating-stoves, gas and oil bar stoves and mullers was shown by Messrs. S. Clark and Co., of Islington; and Messrs. Doulton and Co. had samples of their gas and oil stoves in glazed ware of attractive designs for bars, &c. Of gas-stoves, bar stoves, and mullers, Messrs. Brown, Michel, and Page, Limited, had several varieties. It only remains to say that the Incandescent Fire-Mantel and Stove Company, Limited, had a large and effective stand at which they showed mantels fitted into various types of fire-grates, in some cases with the fire burning; and a goodly number of visitors were attracted by the novelty.

Gas and Electric Lighting in the Manchester Out-Districts.—The Corton District Council have decided to apply to the Local Government Board for power to provide an electric system in the district for lighting and other purposes. They have also appointed a Committee to take into consideration "the advisability of supplying the district with gas of its own manufacture, or by a local authority other than the Corporation of Manchester."

The Price of Gas at Cranbrook.—The gas consumers of Cranbrook are up in arms against a proposal of the Gas Company to increase the price of gas from 3s. 6d. to 3s. 9d. per 1000 cubic feet. A public meeting has been held to consider the subject. It was presided over by Mr. W. T. Winch, who mentioned that some years ago, the price was 3s.; and, when coals were dearer, it was raised in price. For several years, the shareholders had received dividends of 7½ per cent.; and therefore he did not think the consumers were able to bear, in these times of depression, the proposed increase without a murmur. A letter was read from the Chairman of the Company, pointing out that the advance was unavoidable, owing to the outlay on a new gasholder, and that it was necessary to obtain a temporary loan, the interest on which must be met out of revenue. After considerable discussion, a resolution was passed to the effect that the meeting considered the action of the Company in raising the price pointed to an endeavour to increase the shareholders' property at the expense of the consumers. The Directors were asked to reconsider the question.

DUNFERMLINE GAS-WORKS ARBITRATION.

Edinburgh—Wednesday, Oct. 14.

(*Before Mr.* H. E. JONES, M.Inst.C.E., *and Mr.* W. FOULIS, M.Inst.C.E., *Arbitrators. Mr.* J. SHIRESS WILL, Q.C., *Oversman.*)

The proceedings in the above arbitration were continued to-day, at the Balmoral Hotel.

Mr. A. ASHER, Q.C. (Dean of the Faculty of Advocates), and Mr. KINCAID MACKENZIE appeared for the Company; and the Corporation were represented by Mr. T. SHAW, Q.C., and Mr. CLYDE.

On the resumption of the proceedings this morning,

Mr. *Alfred Colson*, M.Inst.C.E., said that in general the works at Dunfermline were good and well situated; but he had found certain drawbacks in them. First, as regarded the size of the settings, he thought the unit was too large, and that more economical results would be obtained if it were smaller. The present settings were eights; but he would recommend fives or sixes. The advantage of this would consist in their being able to proportion the output more accurately to the supply required. Using the larger number in the setting, the disadvantage was simply that they had to employ more retorts than were actually required to produce the gas needed. This meant increased fuel, and also increased wear and tear. He thought the coal could be more economically dealt with if the siding were carried directly through the coal-store adjoining the retort-house, by which barrowing would be avoided. The purifiers were not upon the ground level, but were upon an open floor in a roofed erection. Such a situation was exposed. In his judgment, the purifiers would have been better at the ground level. Purifying apparatus so exposed was liable to give trouble in the winter time, especially in Scotland, he should say, owing to the freezing of the lutes. He found that the condensers, washers, and purifiers were fully equal to the producing capacity of the carbonizing plant; but he could not say the same of the exhausting apparatus. There was only one boiler and one exhauster; and he considered this a great weakness in connection with the works, because in the event of any accident to either boiler, engine, or exhauster, gas would be manufactured under heavy pressure in the retort-house, which would be very detrimental to good and economical working. Of course, that would ensue whenever any breakdown took place in either engine or exhauster. The same was true whenever they required to stop for temporary inspection or cleaning, unless they suspended gas manufacture also, which would be very costly. He did not think the works could be considered fully equipped unless they duplicated these things. The existing gasholder capacity—575,000 cubic feet—was not at all in excess of what was required, having regard to the existing demand that had to be supplied. He also examined the mains at some fifty places. In many cases they were very near the surface. He found some of them 9 inches deep, and others even less. This state of matters existed to such an extent as made it a serious matter as to the efficiency of the mains. As regarded size, a very large proportion of them were altogether too small and inadequate. He never put in a main less than 4 inches in diameter. In this case, he would suggest that all mains less than 2½ inches in diameter should come out, and 3-inch pipes be substituted for them. It would be necessary also to lay at a lower depth those mains which were too near the surface, because they were liable to be damaged by traffic, and were subject to frost. As an illustration of the inadequacy of the mains, he might mention that, when at the works, he was told that no less than 32-10ths pressure was necessary in order to maintain the supply. This pressure was very excessive, and must result in large leakage. Even 25-10ths would be excessive, taking into consideration the difference in level, which amounted to 200 or 300 feet. He made no examination of the meters beyond looking at a number he found in the store-room at the works. So far as he could discover, no periodical inspection of the meters had ever been made. He had looked at the accounts; and he considered that the expenditure upon meters had been very small. In his view, both these things pointed to the probability, at all events, of a large proportion of the meters requiring repair, and even renewal. The book value of the works—which was £62,309, and worked out at £1065 per million cubic feet of gas sold—was very high compared with ordinary standards. He had estimated what, in his view, would be the cost of works of the productive capacity of those at Dunfermline, together with the value of the distributing plant, and also of the excess buildings and apparatus. He took the buildings, plant, and apparatus as capable of producing 500,000 cubic feet of gas per day; and he estimated the cost, as the result of his own experience, at £40,000 per million cubic feet per day. In the present case—

This worked out at	£20,000
Add for provision already made for extensions	3,760
Railway sidings	1,106
Mains	7,981
Services	2,277
Meters, wet, including stamping and fixing	3,287
Meters, dry, including stamping and fixing	1,411
Total structural valuation	£39,822

With regard to the item of £3760 for provision already made for extensions, he worked it out in this way: He took 500,000 cubic feet as being the total possible extension of the retort-house and coal-store; and he estimated the value of this at £5000. From this he deducted £2240 in respect of the retort bench and fittings not there at present, and £400 in respect of the end wall—leaving £2360; but to this he added £1000 in respect of purifiers, valves, and connections, which were capable of bearing the increased production they would have when the works were complete. In his valuation of £39,822, he assumed that everything was new. He allowed nothing for depreciation. That was to say, his figures represented what works of this capacity could be completed for. His valuation worked out to £680 per million cubic feet of gas sold, which was a liberal estimate.

By Mr. JONES: He had based the half-million per day upon the present output. They got 58 millions in the year.

Examination resumed: He was aware that the valuation he had given showed a very marked discrepancy, compared with the book value of the works according to the Company's accounts. The difference would be £25,235. This was to be accounted for, in the first instance, by the writing up of the capital, which they had done at various times. It was also contributed to by the fact that in the accounts no distinctions had been drawn between renewals and extensions of mains in the way in which they had been dealt with, or between new meters and the renewal of old ones. All these were debited to capital; and the renewal of plant and machinery seemed to have been treated in the same way.

Mr. JONES: You began by giving us works and mains and meters all on a scale of 500,000 cubic feet per day. Now 58 millions is not the annual equivalent of 500,000 per day. If you base your calculations on 500,000 per day, you would have to multiply that by something like 160?

Witness: Yes; the equivalent of that would be 75 millions a year. But I take it on the smaller output, as at present. I calculate the mains and meters as they stand at present.

Mr. JONES: If you take the capacity all round at 500,000 cubic feet per day, you will get up to near 100 millions a year; and this would show that you think you could erect works to make 100 millions a year for £39,000.

Examination continued: In the structural valuation which he had put in, what he had done was to estimate the works, not as producing 500,000 cubic feet per day, but as capable of doing so. Of course, 58 millions was the actual production at Dunfermline.

Mr. FOULIS: I think what Mr. Jones means is this: You take the works as capable of making 500,000 cubic feet per day; how many millions do you make in the year?

Witness: At present the output from the works is 58 millions; but when they are worked to their full capacity, they will produce about 75 millions. I have taken the division as 58, because the whole of the distributing plant and meters is as it stands to-day.

Mr. JONES: Then you take the multiplier of 150 days for the year?

Mr. FOULIS: We have been taking it at 170.

Examination resumed: Coming back to the discrepancy between the book value and the actual value, in like manner nothing had been written off in respect of the abandonment of the old works. All these things which went to make up the discrepancy were a departure from the practice that obtained in well-managed gas undertakings. Apart from what maintainable profit by itself might show, it was the case that deficiencies in either works or plant, or a great deficiency in capital account, must have its bearing upon the total price to be paid for an undertaking; and the reason for this was that all these things, sooner or later, had to be made good out of revenue. When he came to estimate the value of the undertaking, he proceeded upon the footing that an investment equal to the security which the Dunfermline Gas Company could give, would pay a certain percentage; and he had based it upon 3¾ per cent. Looking at the matter all round, he thought this was a fair figure and a reasonable basis. Assuming that an investment about equal to the security of the Company would pay about 3¾ per cent., he capitalized the amount of the profit for the year he was dealing with at 26·66 years. From that he made a deduction of 20 per cent., on account of this being a non-statutory Company, which reduced the number of years to 21·33. So far as his experience went, this was the usual difference made between statutory and non-statutory companies; and he thought it was about the same difference as had been made in other cases. He further deducted from the total the expenditure that would be required to make the works and mains efficient and adequate according to his view; and then he made an addition for the excess in buildings and plant. With regard to the profit, the balance of revenue for the five years ending 1894-5 showed an average of £3230. The balance for 1895-6 was £5164; or an increase over the average for the preceding five years of £1934. These figures showed the average net profit for the five years to have been 14·38d. per 1000 cubic feet of gas sold. The figures for 1895-6 worked out at 21·18d., or an increase of 6·80d. Efforts had evidently been put forth, he should say, to make the profit as large as possible. He found that in 1896 there was actually 771 tons less coal used than in the previous year; while the total cost of coal showed a reduction amounting to £1139. The cost of purification was also about £40 less. Another marked feature in the analysis was a reduction of the unaccounted-for gas, the figures for which were: In 1895-6, 8·59 per cent.; 1894-5, 11·17 per cent.; and 1893-4, 17·6 per cent. There was also an increase in the make of gas per ton of coal carbonized; the figures being 9949 cubic feet in 1895-6, compared with 8526 cubic feet the previous year. The illuminating power of the gas last year was 22¼ candles—practically the same as in the previous twelve months. If the last previous record, prior to the past year, which the Company had in their books showed gas supplied of an illuminating power of 25 candles, the drop from 25 to 22¼ candles would be significant of one of the ways in which profit was made. Speaking generally, an increased yield meant a reduction in the illuminating power; but, on the other hand, an increase in the illuminating power usually meant a reduced yield. This was one of the ways in which profit could be made. Over and above that, he considered that the price of gas in 1895-6 was high. He thought it was an overcharge; seeing that the price was 3s. 7d. to the town proper, and 4s. 7d. to the outside districts. On the other hand, he thought that repairs and maintenance were undercharged, at 3·07d. per 1000 cubic feet. Of course, the proper maintainable profit could be arrived at only by a reasonable adjustment of both heads, and after debiting the interest on whatever mortgage debt there was. In order to arrive at a fair price to charge for gas at Dunfermline, he had sought an analogy in the burgh of Kirkcaldy, because, taking it all round, he considered it was very comparable with Dunfermline. He was aware, however, that the illuminating power of Kirkcaldy gas was about 4 candles higher than that supplied at Dunfermline; and in making a comparison between the two, this fact should be borne in mind. Taking Kirkcaldy and Dunfermline alongside each other, he thought the balance of advantage as to the price at which gas could be supplied lay with Dunfermline, inasmuch as the coal there could be delivered alongside the store adjoining the retort-house by a railway siding; while at Kirkcaldy, the coal had to be carted for something like a mile to the works, at a cost, he should say, of about 1s. per ton, or 1d. per 1000 cubic feet of gas made. At the present time, the charge for gas at Kirkcaldy was 2s. 11d. per 1000 cubic feet; whereas at Dunfermline, it was 3s. 7d. There were discounts in both cases. The comparison would then work out that the price at Kirkcaldy would be 2s. 10½d. per 1000 feet; and at Dunfermline, it would stand at 3s. 5½d. He thought that Dunfermline was entitled to a reduction of at least 6d. per 1000 cubic feet in the price of gas. This still left the price 1d. per 1000 feet higher than that charged at Kirkcaldy. Reckoning for the difference in the cost of delivering coal, it was 1·8d. higher; and this was without allowing anything for the value of the increased illuminating power, which he considered might be taken at about 3d. per 1000 cubic feet. These figures made a difference of 4·8d. in favour of Kirkcaldy.

Mr. JONES: So that Dunfermline is practically charged 11d. per 1000 cubic feet more than Kirkcaldy?

Witness: Yes.

Examination resumed: He thought, at all events, it would be fair to take rather more than half of this—viz., 6d.—as representing the degree to which the price was overcharged. With regard to repairs and maintenance, 5½d. per 1000 cubic feet would be a fair charge under that head. This would be the total amount of repairs and maintenance, and would cover the manufacture, the distribution, and the meters. The following was his valuation:—

Profit for the year 1895-6, as per Accountant's statement		£5,164
Less 6d. per 1000 cubic feet, with discounts, 4 per cent. on 58 million cubic feet, sold	£1,404	
Less 2·43d. per 1000 cubic feet for deficiency in repairs and maintenance	593	
Less interest on mortgage debt—£11,900, at 4 per cent.	476	
		2,473
Total maintainable profit		£2,691
This multiplied by 21·33 years amounts to		£57,399
Add value of excess works	£3,760	
Add amount of mortgage debt	11,900	
		15,660
		£73,059
Deduct for cost of additional engine, boiler, and exhauster	£475	
Deduct half cost of laying 10,969 yards of 3-inch mains	893	
Deduct half cost of renewing 1500 services	375	
		1,743
		£71,316
Less difference between book value of the works and actual value		17,000
Net valuation		£54,316

The 2·43d. for deficiency in repairs and maintenance was the difference between the 3·07d. in the Company's accounts and the 5·5d. which he thought should be allowed. He thought £2691 of maintainable profit, was a reasonable and fair estimate of what, in reality, the true maintainable profit of the business was, assuming that the value of the works was as he had taken them—about £39,000. He deducted only half the cost of laying 10,969 yards of 3-inch mains, because a small proportion of the mains which came out would be of some little value, and in putting down the new mains, of course, some provision was made for the future. He took the figure of 10,969 yards from the particulars supplied by the Company; and he included all mains of 2½ inches diameter and under. He arrived at the figure of 1500 services as the result of his own examination. Judging from the number of small services he saw, he thought this would be about the proportion. Those he saw were only ½-inch; and he was not sure that there were not some less than that. They should be ¾-inch.

By Mr. JONES: He examined the ground in fifty or sixty places, and saw a number of services—he could not say how many. From what he saw, and the inquiries he made, he thought if they allowed for 1500, represented by £375, it would not be unfair.

Examination continued: He deducted the £17,000 of difference between the book value and the actual value of the works, because this had not been dealt with in the books of the Company. It was an amount which should be written off. The structural value of the works was less than the book value; and any well-conducted gas undertaking would make provision for getting rid of such an amount. In fact, if the Company had gone on conducting their business, it would have been necessary for them to calculate the percentage to be put aside on account of renewals, upon the book value of £62,000. In other words, the £17,000 would have had to be provided for in the future, as it ought to have been in the past, out of revenue. He quite agreed with Mr. Lass that the Company would have to provide for the wiping off of the amount during the next eight or ten years. They could only have done this by calculating their 1½ per cent. upon the total value of £62,000. They should have started at once to do so, when they abandoned the old works.

Mr. JONES: I would point out to you that 1½ per cent. upon £17,000 is nothing like £17,000. If you add £17,000 to the capital on which you calculate 1½ per cent., you will only get £220 a year, which for 22 years is £5000?

Witness: That will be in addition to the ordinary repairs and maintenance.

Examination resumed: They should, of course, have been writing off at the rate of 1½ per cent. upon the value of the business—of the works, plant, and so on—all along. As soon as in their books the large capital of £62,000 appeared, they should have commenced to write off, and gone on with it.

Mr. JONES: I understood you to say that there was a capital discrepancy of £25,000?

Witness: That is the difference between my valuation of the undertaking and the book value; but the difference between the book value and the capital is £17,000. I make my valuation of the undertaking

less than the book value of the Company. Witness added that in the result the amount was £54,316; and this was, in his view, a fair and full price to pay the Company for the undertaking the Corporation would take over.

Cross-examined by Mr. ASHER: He had advised companies and corporations as to the number of years' purchase to be paid for gas undertakings; but in no previous case had he given an estimate before a tribunal of this description. His experience in this matter had not all been derived from the town of Leicester; nor had it been even chiefly obtained from that quarter. He had never done any valuing in Leicester with regard to transfers; and his experience was based on what he had to do with outside companies. He had been at Leicester for 14 years; and this year their sale of gas had been from 1350 to 1400 million cubic feet. They had carbonized about 140,000 tons of coal. With regard to his valuation, the two items upon which he made the largest deduction were the price of gas and the deficiency in repairs and maintenance. In arriving at the proper price for Dunfermline, he proceeded chiefly upon the analogy of what was charged in Kirkcaldy. When he did so, he was aware that there was an arrangement by which the dividend at Kirkcaldy was not to exceed a certain amount. This would have a tendency to keep down the price of gas. In the case of Dunfermline, there was no restriction whatever in regard to the amount of dividend the Company could pay; but in his opinion that was no justification for their paying excessive dividends. He should say that the dividend they paid last year was excessive, seeing that it was 10 per cent., and that they made no provision for reduction in price.

Mr. ASHER: What is the practical restriction upon those managing a gas undertaking, in regard to the price they will charge for gas?

Witness: First, they should make due provision for the upkeep of their works; and then give due consideration to the consumers.

With regard to the points of advantage in Dunfermline as compared with Kirkcaldy, why should the shareholders at Dunfermline not get the benefit of them?—They would be doing so.

As I understood your evidence, the advantages at Dunfermline should, to a large extent, go to benefit, not the shareholders, but the consumers?—No; I do not say so entirely. If the price of gas were lowered to that extent, it would be the consumers and not the shareholders who would be benefited.

When you have judicious expenditure and good management, why should the benefit go to the consumers, and not to the shareholders?—I say that while the shareholders should get a due dividend, the consumers should be considered at the same time. In this case the consumers have not been considered, inasmuch as the dividend was increased to 10 per cent., and no reduction whatever was made in the price of gas. An increased consumption generally follows upon a reduction in the price of gas.

If, in arriving at your valuation, you make a deduction from the price of gas, must you not make a corresponding allowance for increased consumption?—No; I do not quite follow that.

You diminish the profit by a certain sum, which you say is an overcharge for gas. If you diminish the price of gas by this sum, will you not increase the consumption, with the effect of, to that extent, maintaining the profit?—Yes. I made no allowance for that in my valuation, because I did not think it was necessary. I agree that we are dealing with the maintainable profit.

And you say that the profit cannot be maintained, because too high a price is being charged for gas?—That is one reason. My idea is that it would be impossible for the Company to continue the present high price of gas without running considerable risk of competition, both from the use of oil and electricity.

You have noticed that the price has been maintained, and yet, so far from decreasing, the consumption of gas has been increasing?—Very slightly. I have already admitted that the tendency of a reduction in the price of gas is to increase the consumption; but the increase would be so small that it would not be worth consideration.

Would the increase not be equivalent to a reduction of 6d. per 1000 cubic feet?—No; I do not say that. While, of course, the tendency of a reduction in the price of gas is to increase the consumption, I do not think it would be such as to call for any consideration; and I have made no provision for it in my valuation.

I think you fell into a mistake. You proceeded on the analogy of the price in Kirkcaldy; but you did not compare like with like, because in the year which corresponds with 1896 at Dunfermline, the price at Kirkcaldy was not 2s. 10½d. but 3s. 1½d. per 1000 feet?—I believe they made a reduction during the year. Comparing the same periods at the two places, I do not think I should take the Kirkcaldy price at 3s. 1½d., instead of 2s. 10½d.

If you are mistaken in the price of gas to the extent of 3d. then you have proceeded, to an extent, on a wrong basis in arriving at a valuation?—If there has been any mistake, of course, in the price taken.

Would you not require to make a correction on your figure of 6d. per 1000 cubic feet, which appears in your valuation?—If I have made a mistake, of course I should correct it; but I do not think I have.

In further cross-examination, witness said the figure of 6d. which he had deducted, was arrived at solely with reference to the price in Kirkcaldy, and not with reference to the price charged in other towns in Scotland. He pinned the 6d. to the analogy between Dunfermline and Kirkcaldy, and nothing else, for the reason he had already given; and he thought that, taking the thing generally, it was a very fair comparison to make. With regard to repairs, he agreed that in striking the maintainable profit, what happened to be charged in a particular year was not necessarily the criterion of what should be charged on an average of years. What they endeavoured to reach, in deducting for repairs and renewals, was a figure which, over a period of years, would be a fair average. He took the figure of 2·43d., bringing out £592, as the proper one to be added to the actual amount appearing in the Company's books for the year 1896, which he stated at 3·07d. He thought this quite agreed with the principle he had laid down, that they had to take the average. He did not say that the 3·07d., which was the amount actually charged, was necessarily the average; but what he said was that it was the amount that appeared in the accounts for the year he was dealing with in arriving at the maintainable profit. It would not be fair to take the average; and it would not apply. What they had to do was to take the actual charge for the year under consideration, which was 3·07d., and then, as he said, add the 2·43d.—making 5½d. This 5½d., which was the total deduction he allowed under this head, was taken on the principle of fixing what was fair, as an average, over a period of years.

Mr. ASHER: How can you say that it is fair as an average, unless you first establish that your 3·07d., which is the figure actually appearing for the year 1896, is the average?

Witness: As I say, it would not be right to take the average in arriving at it.

Do you take into consideration the application of Mr. Lass's principle, to which reference has been made; or are you putting that out of account?—My figures are not arrived at on quite the same basis. They amount to practically the same thing in the long run; but instead of taking 1½ per cent. on the structural value, as Mr. Lass does, I put it at 5½d. on the quantity of gas sold. I simply take what appears as the actual charge, and add as much as is in my opinion necessary to bring it up to the average. I have no knowledge of what it costs in a Scotch works to repair and renew; but all that I have given you is from my own absolute experience in these matters.

If it be the case that wages and other circumstances make the cost of renewal less in Scotland, then you agree that 5½d. is not a fair sum to apply?—No. I have made very careful inquiries as to that; and I have come to the conclusion that you cannot do your work any cheaper in Scotland than we can in England. I consider that the 5½d. which applies to England, holds good also in Scotland.

Can you, from your own experience, give us any figure which is derived from knowledge of Scotch undertakings; or is your knowledge entirely confined to England?—To England. But, as I say, I have made careful inquiries as regards Scotch undertakings; and it cannot be done any cheaper on this side than on the other side of the Border To that extent my information is second-hand—from inquiries.

You made some criticisms on the works, especially on the retort-settings. Do you say that you prefer a setting of fives to a setting of eights?—I would prefer fives or sixes. My contention is that the unit is somewhat too large.

When you gave that evidence, had you in mind what the minimum of the unit of production is capable of. Do you agree that it is 8300 cubic feet multiplied by 8?—I took it at 8000 cubic feet. I understand that the minimum on a week day amounts to a little over 600,000 cubic feet.

Does it not strike you that the two correspond in a great measure?—The half would not be sufficient for the minimum; it would require two beds. As you reduced, the make would be less than the productive capacity of the individual bed.

Mr. JONES: Is that not a common thing for works making under 50 millions a year?

Witness: I think not; and I have the general supervision of some ten or a dozen small works, some a little larger and some a little smaller than those we are dealing with. I know that in small works it is a difficulty; but it is one which by care and judgment can be overcome, or nearly so. It would be going to the other extreme to have settings of twos and threes.

Cross-examination resumed: They would not lose any coal storage by carrying the railway into the store. He would have a viaduct on columns, as at Leicester. He found in his own case that this represented a saving of 3d. per ton in dealing with the coal.

Mr. JONES: I make it that this would only save £75. Can you say whether I am right or not?

Witness: It is not a large amount. But what I say is that the structural outlay in carrying out my suggestion would not be more than the expense of a siding on an embankment.

The OVERSMAN: Do you understand from the evidence, Mr. Asher, or is it the fact, that the three sidings on the plan belong to the Company?

Mr. ASHER: Partly only, I understand. They are constructed partly on land belonging to the Gas Company, and partly on land belonging to the Railway Company. It is therefore a matter of contract with the Railway Company that they are to be made as there.

Cross-examination continued: As to the duplication of the boiler and exhauster, there was no balance of advantages between his view and Mr. Newbigging's. If they were duplicated, the interest on the capital would be simply infinitesimal; whereas the loss arising from a breakdown of any of the apparatus might be a very serious matter indeed. He would not suggest that the whole of the mains should be lifted and relaid; but he would strongly urge that what he had recommended in his evidence should be carried out. The work should be spread over a term of years; but he would certainly do it with the least possible delay.

Mr. ASHER: Is it not the case that with English gas you require mains of larger diameter than with Scotch gas?

Witness: Practically there is nothing in it. Of course, the richer the gas the less diameter you require; but, speaking generally, it is not a consideration that should enter into the calculation. There is a difference between the illuminating power of English and Scotch gas—the one being richer than the other.

And that would make a difference in the diameter of pipe necessary to convey the one and the other?—I should not make any difference; but I admit the principle.

By Mr. JONES: A man would not burn so much 20-candle gas as he would 15-candle gas. His works were on about twenty times the scale of those at Dunfermline. A 4-inch main would not, of course, be twenty times the size of a 1½-inch one.

Cross-examination continued: The statement which he produced was headed "Structural Valuation." It was not a valuation of the Dunfermline works as they stood at present; it was his valuation of what he could construct a works of the same productive capacity for. It was based, therefore, not on valuing the works at Dunfermline, but on a calculation brought out on the principle which he had already explained. While this was so, so far as the works proper were concerned, if they referred to his estimate they would find that he calculated the cost of the mains, meters, and services actually. Gas stock could be bought at the present time to yield 4 per cent. He instanced The Gaslight and Coke Company's shares, which he thought they would find gave a little over 4 per cent. When he spoke of efforts

having been made to increase the profit for last year, he did not suggest for a moment that there had been anything in the way of manœuvre. The inference to be drawn from the great contrast between the profit for the year 1896 and the average profit for the preceding five years was that there had been some great improvement somewhere in the working. He had no doubt that the transfer from the old works to the new would have a great deal to do with it. He said there was an obligation on the part of the Company to wipe out the £17,000—the difference between the assets and the book value of the undertaking.

Mr. ASHER: What we have to sell is the maintainable profit. What bearing has this figure upon that?

Witness: It has this bearing, that outside and beyond the maintainable profit, there is an obligation on the part of the Company to bring in line their structural value of the works and the book value—that is to say, they should have set aside years ago a certain sum, and cleared it off. At this date, it should not have been there.

If the Company can make a maintainable profit of £5000 a year with £100,000 of capital, are they not entitled to be paid just the same as a company that makes a maintainable profit of £5000 a year with £50,000 of capital?—No; not if there is this difference between the two, that in the one case the structural value corresponds with the book value, while in the other it does not. Witness added that he put the excess capacity of the purifiers at £1000. He did not include buildings in that. He thought that to include buildings was a mistake, and that the purifiers would have been far better on the ground, without any buildings or covering at all.

I understood that your objection to the present system was that the purifiers are exposed to the inclement Scotch weather?—Yes; being set there at an altitude of some 20 feet above the ground, they would be more exposed than on the ground.

If they were on the ground, they would require a building to protect them?—No. My purifiers are all in the open, with only a shed alongside; and I find that a better arrangement. Witness went on to say that there was no excess capacity in the gasholders which should be imputed to excess works. The capacity was 575,000 cubic feet, and the make of gas was 380,000 feet; but he did not consider there was any excess there. He should make the comparison with the productive capacity of the works when in full operation. It was very common to arrive at the excess in the works by comparing their present capacity, one part with another. Of course, comparing the present make with the capacity of the gasholders, there was a considerable margin, but not, in his judgment, any too much. No allowance required to be made for that in his schedule of surplus works, because he did not consider it any too much. It led to economical working to have plenty of storage capacity.

Re-examined: It had been his invariable practice to advise gas companies that they must proceed without delay to write off from revenue any discrepancy between the actual value of their works and the book value of them. In some cases, he had gone so far as to recommend the declaration of no dividend at all, with a view to this being done. He would prefer not to mention the names of companies.

By Mr. JONES: He did not know of any company which, after having works in operation for 20 years, had had in hand an accumulated sinking fund for the depreciation of works in the manner he had described.

Re-examination resumed: He had not any special knowledge of Dunfermline; but from all he had heard, he did not think there was any available margin for increase of gas consumption. The business of the Company seemed to have been a fluctuating one, not showing any great elasticity. It would be seen from the "JOURNAL OF GAS LIGHTING," that the yield on The Gaslight and Coke Company's shares was £4 2s. The whole of the shareholders in the little Company in Dunfermline could invest in this stock without making the smallest difference in the market price. It was considerably in excess of his 3¾ per cent.

Mr. SHAW: I have now before me the agreement with the Railway Company with regard to the siding; and I wish to put four points in it to you. The first is that the North British Railway Company have power, whenever they like, to alter the line or level of the siding, provided only that they maintain connection with the Gas Company's ground. The second point is that the Gas Company have not merely to pay the cost of construction, but to bear the whole maintenance of the siding; and this is to include the signals, points, sidings, and buffer-stops. The third is that they have to maintain them in perfect order, and to the satisfaction of the Engineer of the Railway Company. Lastly, the Railway Company, and also the Earl of Elgin and his successors, have power to connect with the siding, and to take traffic over it—all without making any payment or compensation to the Gas Company; the only thing being that the use which the Gas Company have is not to be interfered with by the traffic these people carry on. What do you think of this agreement?

Witness: My opinion is that it is a very one-sided affair. It differs very materially from the agreement we have with reference to our sidings. It is a very onerous bargain.

By Mr. JONES: He could not say that, assuming there was a margin for a reduction of 6d. per 1000 cubic feet in the price of gas, he had ever known of companies which made such a large reduction as that within a year of adding to their capital for entirely new works.

By Mr. FOULIS: When old works were done away with, and entirely new ones were started, it was only the difference in capacity that should be placed against capital.

The OVERSMAN: A table was put in by Mr. MacPherson showing the prices that were being charged at various places with a population of over 10,000 and under 40,000. We should like, between this and the day we meet for the arguments, to have this table corrected in the following respects: In the first place, another column should be added showing the prices now being actually charged; and for this purpose inquiry should be made of the secretaries or other officials of the various companies. I know perfectly well it is not strictly legal evidence; but we desire to have it as the best obtainable. We should also like to know the illuminating power in each case; whether any, and what, discounts are allowed; whether any, and what, meter-rents are paid; the quantity of gas made; and the quantity sold.

Mr. *J. S. Gibb* said he was Treasurer to the Edinburgh and Leith Corporations Gas Commissioners. Mr. Millar called at his office the day before, and made up statements of the average candle power of the gas supplied by the Commissioners. He had compared the statement with the figures in the minute-books of the Commissioners, and he found it to be correct.

Cross-examined: Personally he had nothing to do with ascertaining the actual candle power. He had no knowledge that there was any discovery lately that the actual illuminating power was very much less than that recorded. It was a fact that the gas was tested by a person who came from Liverpool, with the result that it showed less than the recorded candle power; but this was not brought officially under the notice of the Town Council?

Re-examined: He knew nothing of any complaint, except what he saw in a newspaper report of what a Town Councillor stated an Englishman had said to him.

Mr. *J. Mungall* said he was one of the Directors of the Cowdenbeath Coal Company, Limited. He was acquainted with the operations of the coalfield for the past 30 years. He was a member of the Town Council of Dunfermline, and held the office of Dean of Guild. He had known the town of Dunfermline for 50 years; and he did not think the size or the population was likely to increase to any appreciable extent. There was only one industry in Dunfermline—viz., the manufacture of linen goods. There was nothing else to induce a population to come to Dunfermline; there was no employment for them. Attempts had been made in his time to introduce engineering and ironfounding; but all had failed. The revenue of the town depended very largely upon royalties on coal under property of the burgh. These amounted in 1892 to £3612; in 1893, to £3500; 1894 was the year of the strike, and could not be compared; and in 1895, to £2890. The Townhill field was nearly exhausted. If the Townhill colliery were to stop, one effect would certainly be that the village of Townhill would be to a considerable extent depopulated. Townhill was supplied with gas from Dunfermline. A large number of feus had been given off in recent years; but he was sorry to say that the demand had at present fallen. According to Scotch law and practice, all the building plans had to be submitted to the Dean of Guild Court (of which he was head) for approval; and he spoke officially. In his opinion, the town was overbuilt. He would not describe "jumbo nuts" as cannel coal, though they contained a very small proportion. They were the large portions of the coal that were taken out of the dross. He did not think the business of the Gas Company would be an increasing one—he did not see where the increase was to come from. As a partner of Steel and Co., he knew that some years ago they considered the subject of the introduction of electric light into their factories; but they had not space to erect the necessary machinery, and so the project had to be abandoned. They had now got more space; and it was his intention to move again that electric light be introduced. His expectation was that the price of coal would rise.

Cross-examined: He thought the population of Dunfermline was likely to start decreasing in about two years, when the collieries at Townhill and Wellwood began to be exhausted. Four years ago he purchased a property at Dunfermline, called Transy. He had had a feuing plan of the ground prepared; and at the present moment houses were being built upon Transy. He did not think this an injudicious proceeding, because there were many valuable sites upon the property which were not to be had in every part of the town. Both the price of the gas and the quality of it were against an extension of its use. He did not think they had anything to fear from electric lighting being taken up by the Corporation; but they had to fear its being taken up by private individuals. They would never increase the consumption of gas for cooking, heating, and motive purposes at its present price. In his own house, he put in appliances for using it in this way; but he found he could not do so, as it was too expensive. He expected that gas would be taken up for these other purposes, the consumption would increase, the price go down, and the profit remain as good as ever; but his experience had not warranted such an opinion.

Re-examined: If the demand for electricity in factories was to be effectively competed with, he thought there would have to be an improvement in the quality and a very considerable reduction in the price of gas. The quality had been very bad indeed—so bad that in the factories work had to be stopped sometimes for want of light—and the smell from the gas was such that people occasionally had to leave the place unwell. This was his own experience, in many houses. He knew that several parties in Dunfermline had taken to paraffin oil, in consequence of the quality of the gas; and he had seriously thought of doing the same.

Further cross-examined: The quality of the gas was so bad as to be unsatisfactory, both when it was being manufactured in the old works and in the new. He could not give an instance, in the time of the new works, of a complaint being sent to the Gas Company as to the smell and the quality of the gas. He had made verbal complaints at different times since they went to the new works; and he could make one just now. Only two nights before, the gas was very bad indeed. He had not made formal complaint to anybody on behalf of the Gas Company in regard to the quality of gas since the new works were erected.

By Mr. JONES: When the gas was so bad two nights before, it was not in the matter of smell.

By Mr. FOULIS: They had only one class of cannel out of Cowdenbeath. He could not explain how in 1895 the Gas Company bought from the Cowdenbeath Coal Company cannel at 10s., 15s., 14s. 6d., and 12s. per ton. Possibly these would be old contracts running on; and the price might have been influenced by the strike in the end of 1894. Besides cannel, the only coal they sold to gas companies was splint, five-feet seam, and "jumbo nuts."

Mr. *J. Kirk*, Manager of the Castle Blair Linen Works, Dunfermline, said they had an electric light installation for about three-fifths of the whole works. They were now adding about 110 16-candle power lamps to it—in short, they were doubling their electric light supply. He intended to burn all the gas he could get. They had not enough gas, or they would not want electricity. He considered the cause of this was the want of a main-pipe. They applied to the Gas Company to remedy the defect in June or July of the present year; and they declined. In consequence of this, they had had to go on with the installation of a double supply of electric light.

Cross-examined: The introduction of electric light into the Castle Blair works had not diminished their gas account a halfpenny. They

had not enough gas; and they must have light. They found the gas quite satisfactory, if they could get sufficient; but the electric light was the best.

Re-examined: In June last, when they applied to the Gas Company for more gas, they got a reply stating that in view of the Corporation acquiring the works at an early date, they could not see their way to expend further capital. It was in consequence of this that they put in electric light.

This closed the case for the Corporation.

Saturday, Oct. 24.

The Court met to-day for the hearing of Counsel upon the evidence.

Mr. ASHER, for the Company, said he had never, throughout the whole of the case, been able to see what the amount of the capital standing in the books of the Company had to do with the thing which the Corporation were buying. They were purchasing a going concern, which was to yield them a certain sum—in round figures, £5000 a year. What did it signify whether the capital which was originally embarked in setting up the undertaking was £5000 or £50,000? The amount of the dividend paid should be eliminated from the case. The fallacy which was at the root of all this part of the case, was the failure to distinguish between the divisible and the divided profit. In considering whether the profit was maintainable, probably the first thing they would think of was the kind of business it was—the works, the plant, and everything connected with it. They had new works, put down on a site which everyone admitted was excellent. They were said by everybody to be first-class works, good in design, thoroughly equipped, and in the best possible situation. The duplication of the boiler and exhauster was unnecessary for the purpose of maintaining the profit. It was said that the main pipes were too small; but this was not the question. The question was whether there was anything in the mains which should prevent them doing their work so as to maintain the profit. The whole of the matter, in this respect, really came to be exploded by the application of the practical test—what was the unaccounted-for gas? Finding that it was 8¼ per cent.—or 2 per cent. better than the average of the towns of Scotland—how could it be said that the state of the mains and services was such as to imperil the maintenance of the profit? Then they had surplus producing power in the works. It might be thought that the chances of increased consumption were not sufficiently large to make this margin of appreciable value. He was going to join issue with that view of the case, because it was about as certain as anything could be which was in the future, that the demand for gas would increase. In support of this view, and also of the improbability of the gas undertaking suffering from the introduction of electric lighting, he quoted from the address of the Provost of Dunfermline to the citizens a few months ago. They were told, and rightly too, that there was risk of competition; and, of course, they must regulate their business so as not to bring these risks upon them. But short of overcharging, so as to induce competition and the alienation of their business, he saw no principle which would restrain the Company from charging what they thought proper. The price of gas was fair and reasonable. For the past ten years, it had been 3s. 7d. per 1000 feet, with the exception of one year, when it was 2d. less. Was it fair to suggest, in such circumstances, that the price should come down for the purpose of estimating the profit? Keeping in view that this was a non-statutory Company, he submitted that the basis of price was 26·6 years' purchase of the profit. They must also remember that this was a compulsory sale—the matter was not initiated by the Company desiring to sell, but by the Corporation coming to the Company with a weapon in their hands which was irresistible.

Mr. SHAW, for the Corporation, characterized the claim of the Company as an extravagant and inflated one. He submitted that the best possible real evidence as to what was a reasonable price for gas was to be found in what was charged between 1853 and 1890, during which time there were agreements with the Corporation as to the price. In 1890, the old policy of wisdom appeared to have been departed from; and there then began a course of self-arrangement, which was quite irrespective of a sound view of the permanent stability of the Company. They appeared to be determined to pocket the present good, at the peril of ultimate extinction. Early in these proceedings, the hint was given that the battle always raged over the last profits, and whether they were legitimate. Well, there never was such a gross case of inflation of capital as there was when the Company went into new buildings, and included as capital the entire building which they had vacated and sold for an old song. The Company adopted the policy of gradually reducing the illuminating power of the gas. They did all this with no reserve, and no allowance for renewals; and last year they actually divided among themselves more than they earned within the twelve months. The last balance-sheet had evidently been prepared so as to make a brave show before the Court. He argued that the Company were not being compelled to sell; all that the town did was to acquire powers to enable them to enter into competition with the Company. The Company, by charging 3s. 7d. per 1000 feet for 22½-candle gas, put themselves in extreme peril of competition by the town, which would have had no dividend to earn. They would have been bound, on encountering opposition, to have reduced the price of gas; and therefore their net revenue was completely imperilled—in fact, their profit would have been reduced to nothing. There should have been a reduction of at least 7d. per 1000 cubic feet. When this reduction was made, the net profit would have been £2576 Multiplying this by 22½ years, they had £57,960 as the price. No doubt the works were capable of extension; but the town was not likely to extend, and accordingly there was in the surplus works a lot of dead capital, which he had to pay for. This excess plant—which he took at £4500—and the mortgage debt, raised the capital to £72,967. If the £17,000 which had been spoken to were taken off, it would leave the capital account at £55,967. If only £12,647—the amount to which the capital was written up—was deducted, the capital account would stand at £66,320. This, he contended, was the figure which, on the Company's own showing, should be paid; and it was inclusive of the mortgage debt. Making all the allowances and deductions, the price he arrived at was £59,428. If they took the highest price at which shares were selling—£29 10s., for a £25 share—there were 203½ shares; and the price realized would be £59,398, which was within a few hundred pounds of the figure he had arrived at. If they paid anything like £80,000 to the Company, they would be giving £40 for each share the market value of which was only £29s. 10s.; and this, he contended, would be unconscionable.

The Court took time to consider their award.

BELFAST CORPORATION GAS SUPPLY.

Reductions in Price *v.* Large Profits and City Improvements.

At the Quarterly Meeting of the Belfast Corporation yesterday week, the Gas Committee presented a report in which they recommended that the price of gas should be reduced from 2s. 9d. to 2s. 6d. per 1000 cubic feet, subject to the usual discounts.

Alderman Sir D. DIXON moved the adoption of the report.

Mr. LINDSAY seconded the motion with great pleasure, seeing that the report contained a recommendation for a reduction which would, he believed, benefit the poorer class in the city.

Alderman Sir J. H. HASLETT dissented from the idea that the reduction would be a decided benefit to the humbler class. The members of that class were not consumers of gas to any large extent. He would be very glad if, before resolving upon such a step, they would refer the matter to the Public Health, the Improvement, and the Gas Committees; and for this reason: At the original inception of the gas undertaking, the ratepayers generally became guarantors for the concern; and, if the works were not remunerative and did not produce a profit, the rates became pledged for the security of the undertaking. The Corporation were at present face to face with difficulties that must be met either by direct taxation or other means. They had slums to be cleared away, and breathing spaces to be produced; and he held that instead of reducing the price of gas, the Corporation should devote the £15,000, to which the reduction would be equivalent, for some years to come for permanent improvements in connection with the older parts of the city. He did not deny that, in supplying cheap gas for the manufactories, they were conducing to the welfare generally of the city; but in granting a reduction which would practically lower the price to 1s. 10½d. or 1s. 11d. per 1000 cubic feet to large consumers, they were coming very close to the cost of production, and not expending the profits of the gas on what would be the best means of promoting the prosperity and welfare of the city. It might be said that this was not the popular side of the question. He did not crave popularity in this direction; but he asked the Council to consider whether the plan he had suggested was not the most reasonable manner of doing away with malformations in the city.

Mr. HARRISON thought Sir James Haslett had made a mistake with regard to the objects for which the gas-works existed. They were not established for the purpose of an indirect tax upon the citizens, but for providing gas as good and as cheap as possible. Sir James's position was this: That the Corporation should continue, though the large gas consumers were giving little or no profit, to tax the rest of the people for the purpose of carrying out much-needed improvements. They were all at one with regard to the desirability of sweeping away the slums; but why should the large consumers be saved bearing their share of the burden? He did not agree that the artizan class used a comparatively small amount of gas. He believed that, in two out of every three houses inhabited by that class, gas was used; and small shopkeepers were also consumers.

Sir J. HASLETT then moved, as an amendment, that the report be adopted, omitting the paragraph relating to the reduction in the price of gas, and that the subject be referred to the Gas, Public Health, and Improvement Committees.

Alderman M'CONNELL, who seconded the amendment, expressed a preference for an equalization of the price all round. He did not think the large consumers should be supplied at practically below cost price. When the charge was last reduced, he asked the then Chairman of the Gas Committee to devote some money to public purposes; and he replied that he would reduce the price of gas instead. He (Alderman M'Connell) then inquired of Mr. Stelfox what the price would be; and he told him that the charge to large consumers would be 2s. 1d., and the cost of production would be 1s. 11d.; so that the margin was very small. He thought the most equitable thing to do in the meantime would be to allow the price of gas to remain as it was, and to devote a considerable sum for public purposes. The time had come when the rise in the taxation of the city should stop if they were to have any regard for the progress of the city.

Mr. CURLEY, who moved in the Gas Committee that the price should be reduced, said he still adhered to the opinion that the reduction would be beneficial. By the adoption of the recommendation, they would be able to stop the payment to the Government of £500 a year for income-tax. (Laughter.)

Mr. WEIR remarked that, if the gas profits were devoted to any other purpose than reducing the price, it would be entirely a mistake. If errors had been committed by the Improvement Committee in regard to buildings in the past, it would be a fatal mistake if they were to take the profits of the gas-works for the purpose of remedying the evils.

Mr. J. M'CORMICK was in favour of a reduction in the price of gas, but not of the way in which it was to be done. He thought it was unfair—almost dishonest if it was not sanctioned by Act of Parliament—to supply gas to one portion of the community at one-fifth less than was being charged to another. He believed it was within the power of the Corporation to give further reductions to the smaller consumers without increasing the rebate to the larger consumers. He would be inclined to support the amendment if it was modified by referring the whole question to the Council in Committee.

Mr. W. M'CORMICK was in favour of the reduction. He said the present system was perhaps not the most equitable to adopt; but it was the only way by which small consumers could get a reduction. If the profits were to be distributed between the new City Hall and the removal of slums and other improvements, where would the small consumers ever get any benefit at all? The rebates to large consumers came to them from the old Company; and Alderman M'Connell should

assist those who were desirous of getting power in order to remove such inequalities.

Mr. HARPER said, if the Committee were able to pay their way, and have a reasonable sum for the reserve fund, it appeared to him beyond all question that it was their duty to reduce the price in the way they suggested.

Sir D. DIXON said the matter had been very carefully considered by the Gas Committee, who believed that, even after reducing the price by 3d., they would still have a large surplus to use in the way Sir James Haslett had mentioned.

The TOWN CLERK said it had been stated that, with the reduction, the large consumers would be getting gas at, or at less than, cost price. That was a fallacy. The large consumers would be paying a considerable profit. That was the actual fact; and it was given to him in figures by Mr. Stelfox.

Mr. HARRISON: What is the cost of production?

Sir D. DIXON: About 1s. 6d.

The amendment was then put to the meeting and defeated, as was also another adopting the report, but omitting, and referring back, to the Gas Committee only the paragraph as to the reduction.

The original resolution was then carried.

EXTENSIONS AT THE LEEDS CORPORATION GAS-WORKS.

A Large Inclined Retort Installation.

The Leeds City Council recently decided to apply to the Local Government Board for power to borrow £100,000 for the extension and improvement of the gas-works. Of this sum, it is proposed to spend £22,463, in the installation of inclined retorts at the Meadow Lane works; and among the recommendations which the Gas Committee had prepared for presentation at yesterday's meeting of the Council was one asking them to accept the tender of Messrs. Little and Graham for the work. It is intended to commence at once the construction of settings containing in all 196 retorts on this system; and the completion of the contract will increase the production of gas by 2¾ million cubic feet per day. The present daily maximum make at all the works is 14 million cubic feet. There will be no displacement of the staff of men at Meadow Lane; on the contrary, the extensions will find employment for extra hands. Other additions at the Meadow Lane works include the building of a retort-house, &c., at an estimated expenditure of £9000; the construction of coal-stores, at a cost of £4122; and the erection of hydraulic mains, purifiers, condensers, exhausters, &c., involving an estimated outlay of £14,000. The Gas Committee have also been introducing improvements at the New Wortley station. The installation of hydraulic and compressed-air charging and drawing machinery by which the two chief retort-houses will be worked are practically completed; and as soon as the boilers are coupled up, the appliances will be brought into operation. An expenditure of about £17,000 will be incurred in connection with these machines and incidental work. Further coal storage is likewise being provided here, as well as an underground tar-tank, entailing together an outlay of £4996. Besides the foregoing expenditure, it is contemplated that during the next five years £28,510 will be required for the extension of gas mains and services throughout the city. On the basis of an annual increase of 5 per cent. in the consumption of gas, the plans of the Committee are expected to cover the requirements of the city for the next five years or more.

HUDDERSFIELD CORPORATION GAS SUPPLY.

The Past Year's Working—The Progress and Present Position of the Undertaking.

The usual "Mayoral Statement" as to the working of the various departments of the Huddersfield Corporation in the past year contained the following remarks on the progress and present position of the gas undertaking, which is under the supervision of Mr. W. R. Herring:—

The financial results of the past year's working of the gas undertaking have proved to be of a satisfactory character. The gross profits for the year ending March 31 amounted to £24,612 13s., compared with £19,603 5s. 2d. for the previous year. Of the former sum, £12,388 18s. 3d. was paid in interest on loans; £1733 16s. 2d. for redemption of capital account; and the balance, amounting to £10,489 18s. 7d., was transferred to the repairs and maintenance of works account. The reconstruction scheme, which was inaugurated in 1892, has now been completed, at a total cost of £96,392 5s. 1d. This, it may be stated, is within the amount of the original estimate, which was £98,500, or £2107 14s. 11d. less than was originally estimated.

The conditions which brought about the reconstruction of the works originated primarily in the serious diminution in the balance of profits of the gas undertaking which had hitherto been transferred in aid of the borough fund. The balance remaining to be transferred for the half year ending Dec. 31, 1891, amounted to only £174 18s. 8d., as compared with £3001 11s. 4d. for the corresponding period in the former year. This naturally resulted in searching inquiries being made into the cause; and the Engineer was instructed to make a thorough investigation, and report upon the capacity and condition of the gas undertaking. This report, a copy of which was embodied in the minutes of the proceedings of the Council for 1892, was laid before the Committee in March of 1892, and it was shown that the buildings, plant, and apparatus then existing on the No. 1 and No. 2 sections of the works were such that the conditions under which gas was then manufactured were upon principles not recognized as being the best, or as practised in all modern works. The plant that did exist was insufficiently equipped with apparatus for properly dealing with the gas that the then retort-houses were capable of producing, even upon the old lines upon which the works were designed and built some forty years previous. As a result of the defective condition of the plant, it was impossible that economy and efficiency could be obtained under the existing conditions. As a consequence, coal of a much higher value had to be employed to make up for the deficiency of the apparatus; while at the same time an irregular quality of gas was supplied, which was also improperly purified.

The matter was thoroughly thrashed out by the Gas Committee between March and November, 1892; and in considering comparative detailed estimates of the cost of adding to, and making good as far as practicable, the plant then existing, as compared with the entire removal of the same, and the erection on the same sites of new plant of modern design, it was shown that the latter could be performed at less cost than the former. It was then resolved that the various works indicated in the report should be carried out. These works comprised the pulling down of the existing old plant and buildings, and the erection on the same site of modern plant of greater capacity. By this means the site that formerly was occupied for the production of 1,750,000 cubic feet of gas per day is now available for the production of 5,000,000 cubic feet daily, and comprises the following plant and buildings: Retort-house, boiler-house, engine-house, governor-house, workshops, coal wharves, coal-testing station, coal-stores, retaining and boundary walls, carbonizing plant, automatic coal-handling plant, condensers, boilers, exhausters, scrubbers, purifiers, revivifying shed, station meters, station governors, mains, valves, pumping-engines, coal-store sheds, road making, draining, paving, &c., all of which have been carried out in a thoroughly substantial manner, and, from a technical point of view, are admitted to be among the best-built works in the country, and have been spoken very highly of by various experts who have visited the works from time to time.

The most conclusive proof that can be given of the necessity for the reconstruction and remodelling of the gas-works is to be found in the published accounts of the gas undertaking for the year prior to the commencement of the scheme, and for the past financial year. During 1890, the total expenditure per ton of coal carbonized, including all manufacturing charges, materials, labour, maintenance of works, plant, &c., meter inspection, rents, rates, and taxes, and general establishment charges, was £1 3s. 6d. During the year ending March 31 last, the expenditure had been reduced to 17s. 8½d. per ton. During that year, the consumption of gas for lighting purposes decreased by 1½ per cent., which is probably accounted for by the extremely fine and open winter, and the fact that few of the mills worked after daylight during that period. On the other hand, the gas used for cooking, heating, and motive power purposes increased at the rate of 14 per cent. During the year, 320 additional consumers have been added; making a total to the present date of 19,000. In addition to this, 156 new service-pipes have been attached to the Corporation mains.

Considerable trouble is being experienced at the present time owing to the practice in times gone by of laying small service-pipes to houses and premises throughout the area of supply, and these of ordinary wrought iron. As a result of this, the natural wear and tear and corrosion of the pipes, both internally and externally, is causing inconvenience to many, through the same becoming partially choked; and, as a consequence, a far higher pressure of gas has to be maintained at the works than should be necessary, in order to enable these small pipes to carry the quantity of gas now required of them, particularly during the heavy lighting hours of the evening, when the full consumption is demanded by mills and workshops, &c., which, in many instances, is treble the amount for which they were originally put in—the consumption per head of the population being naturally on the increase. During the past year, no less than 306 defective service-pipes have been taken up and relaid, only part of the expense of which has fallen upon the Corporation. Some of these have been in the ground for upwards of fifty years. There is no doubt that the distributing system of the Gas Department from the works as far as the consumers' meters will have to be thoroughly overhauled, and in many instances enlarged and relaid. At the present time, pressure surveys are being taken throughout the districts; and the matter will be dealt with as soon as the necessary information is in hand to enable a just opinion to be formed as to the requirements of the respective areas of supply.

A new department in connection with the gas undertaking has recently been inaugurated, which, if the public will take advantage of it, will prove of considerable benefit to themselves—that is, the hiring out of gas cooking and heating appliances at moderate rentals. The Corporation have also, in response to the spirit of the age, determined to introduce the "penny-in-the-slot" meter, whereby gas can be obtained by the pennyworth, which charge includes the cost of the meter, fixing it, and the internal fittings in connection therewith, as well as the supply of a small stove. There will be 25 cubic feet of gas sold for 1d., which is sufficient to supply one good burner for about five hours' lighting. By this means it is hoped that the ratepayers who are not at present gas consumers will recognize the advantage of becoming so, and remove from their homes the highly dangerous and expensive oil-lamps.

Outside Authorities and the Wakefield Water Supply.—At a recent meeting of the Castleford District Council, allegations were made as to the water supplied by the Wakefield Corporation having of late been very turbid; and it was suggested that a sort of Defence Association should be formed in conjunction with the neighbouring authorities. It was also complained that Wakefield had delayed for five years the construction of the filter-beds, expressly provided for in their Act of Parliament. The Council decided to place themselves in communication with other neighbouring local bodies, with the view to forming a combination for the special purpose of compelling the Corporation to proceed with the filter-beds.

Gas and Water Profits at Salford.—The Finance Committee of the Salford Corporation have issued their annual report, which embraces an abstract of the accounts for 1895-6 of the Borough Treasurer (Mr. J. Carter). It shows that the gas-works surplus on the year was £9000; and on the water-works, £4025. The gas profits transferred to the district fund in aid of the rates were £14,780 less than in the previous year. This is accounted for as follows: Allowance of a discount of 2d. per 1000 cubic feet, £5692; reduction in the selling price of residuals, £4904; increase in rates and taxes, £3312; miscellaneous, £872. The water-works profits were £228 less than last year; but the difference is more than accounted for by the increased rates on the undertaking.

ELECTRIC LIGHTING NOTES.

The question of the provision of additional works in connection with the electric lighting undertaking was again to the fore at last week's meeting of the Belfast Corporation. A report on a proposed site for a new central station was presented by the Electric Lighting Committee, whose Chairman (Mr. Andrews) gave the Council some information to show the absolute necessity for further development. It appears that the building of the present station was commenced on June 21, 1894, and that in the following January current was supplied from it. The original capacity of the works has been twice increased; and now it is questionable whether it would be possible to connect any more large customers. The existing station has a capacity for 17,100 lamps; but the applications number 17,145. There is a standby of 20 per cent.; and it is estimated that only 65 per cent. of the lamps wired would be running at one time. With regard to the finances of the department, Mr. Andrews stated that, in the first eleven months, there was a small surplus over station cost—of course, without interest or depreciation—of £373. For this year in every quarter they had had a surplus of revenue over station cost; and, taking the increase of revenue in the December quarter to be commensurate and on the same scale as in the September quarter, he thought that probably at the end of the year they would be able to show about £2000 revenue, which would be applicable to the payment of either interest or depreciation, or for other purposes. In other words, they would have enough money to enable them to pay interest to the Gas Committee for the amount of their loans from the day that they were granted. Taking into consideration the difficulties the Committee had had to deal with from the first, they might confidently state that if they had a good station such as he asked the Improvement Committee to give them facilities for establishing, the city would not lose any money in their electric lighting venture. The amount required to construct the station would be about £50,000. The report was adopted.

The abstract of the accounts of the Finance Committee of the Salford Corporation which has lately been issued shows that the deficiency on the electric lighting accounts at the close of the last financial year was £2624.

The Fareham District Council are proposing to put their electric light works into order, to ensure the continuity of the supply. For this purpose, they have applied to the Local Government Board for power to borrow £1900; and the usual inquiry has been held by Mr. F. H. Tulloch. The work which is to be undertaken (by the advice of Mr. E. Manville) is the provision of duplicate engines and plant at the station, and the extension of the distribution system.

Mr. Rienzi Walton has held an inquiry at Wallasey respecting an application by the District Council for power to borrow £17,500 for electric lighting purposes. It is estimated that the applications already received for the electric light will nearly pay the interest on the capital and the working expenses.

Much interest has been displayed by the ratepayers of Bath in the proposal of the Corporation to acquire the Electric Light Company's undertaking, and to extend the supply. The position of the Company's business is this: They have 12,000 lights connected to their system; and they have been obliged to refuse applications for light because they have not the power to supply it. In 1894, they made a gross profit of £1570 on a capital expenditure of £39,000; and they could, it is said, have paid a dividend of 4 per cent., but it was decided to keep the money in hand. This year, up to the end of October, the net profit has been only £700; but in the next two months, the Company will make—it would be better to say, they hope to make—£700 more. Although the capital expenditure amounts to £39,000, Professor Kennedy, the expert appointed by the Board of Trade to value the property, has put the price to be paid by the Corporation at £24,500! To enable them to effect the purchase and carry out extensions, the Council originally asked the Local Government Board to sanction a loan of £45,000. But since then further extensions have been suggested as necessary; and the amount applied for has been increased to £58,000. On behalf of the Local Government Board, Mr. F. H. Tulloch has held an inquiry regarding the application; and the facts set forth above and other information were imparted to him. The Consulting Electrical Engineer to the Corporation (Mr. Hammond), touching on the point as to whether the undertaking would pay, said he averaged the price for private lighting at 5¼d. per unit, which was equal to about 3s. per 1000 cubic feet for gas; the price in Bath being 2s. 6d. With the plant in full work, they would supply about half a million units per annum, realizing £9285; while for the public lighting £2110 would be received. He calculated the cost of production at 2¾d. per unit. The interest and sinking fund on £58,000, at 5½ per cent., would make an annual charge of £3045; and after allowing £1000 a year for depreciation, there would be a margin of £1651. The opposition to the application was a strong one. The Ratepayers' Association were represented by their Secretary (Mr. Hawes), whose remarks were rather pointed. He said that he considered the Council were not justified in applying such a large amount of public money to a scheme of so risky and problematical a character. If the career of the Company up to the present time had not been a financial success, although everything had been in their favour, he could not see how, by extending the system into the proposed districts, it could be at all profitable to the city. He thought the spending of £24,000 on a comparatively old and worn-out concern was a grave matter. The Inspector did not think the latter remark was fair after Professor Kennedy's report; but he had a doubt as to whether so large an amount for extensions was required at present.

The Electric Lighting Committee of the Southampton Corporation, with the concurrence of the Council, have resolved to reduce the maximum price for current from 7d. to 6d. at the close of next March quarter, and to lower the charge for motive power to the Harbour Board and other consumers from 6d. to 3d. per unit after the Christmas quarter.

At the meeting of the London County Council last Tuesday, the Finance Committee recommended that the application of the Vestry of Islington for a loan of £31,000, towards defraying the cost of an electric light installation in that parish, be granted to the extent of £24,000, interest being charged at the rate of £2 17s. 6d. per cent. per annum; and that it be notified to the Vestry that, as they have elected to spread the whole of the initial cost of the installation over 42 years, the Council will decline to give their sanction to the raising of any money to replace any of the plant and machinery which may be necessary during the currency of the loan, and will expect the Vestry to provide for all renewals required during that period out of a sinking fund to be established or from the maintenance account. This was agreed to.

Hitherto the Hampstead Vestry have wisely confined their public lighting by electricity to the Finchley Road; and that it has been an unqualified success there, not even the most ardent supporter of the electric light can allow. At last Thursday's meeting of the Vestry, however, the Electric Lighting Committee brought up the following recommendation: "That High Street and Heath Street be lighted by 28 arc lamps, as shown on the plan submitted to the Committee, at an estimated cost of £1625; such sum including the necessary lamps, switches, cut-outs, lamp-posts, cable, engine, and dynamo, with all necessary foundations and connections." The Chairman of the Committee, in a long speech, moved that this be done. He instanced St. Pancras and Islington as examples of successful street lighting, and exulted over the fact that "even the conservative Vestry of St. James's are now extensively adopting it." As to their own installation in the Finchley Road, he maintained that the shop trade had necessarily improved; while from a moral point of view the brilliant lighting had a much-needed effect in that vicinity. The present cost of lighting the proposed thoroughfares by gas was £253 per annum; and the cost of the 28 electric arc lamps that would replace the 81 gas-lamps would be £830 per annum—three-and-a-half times as much; but the streets would be ten times as well lighted. After this announcement, a long discussion ensued; the general opinion of the Vestry being that more details as to the position of the proposed lamps and the items of cost should have been submitted. The financial question was not altogether lost sight of; Mr. Aitcheson moving, as an amendment, that the matter be referred back to the Committee for further consideration and report. He was in favour of the extension of private electric lighting; but he thought the streets should not have arc lamps until it was more evident that such lighting would be a commercial success. When some profit had been made on private lighting, it would be time enough to make this further big experiment. The member who seconded Mr. Aitcheson's amendment thought that a more detailed scheme should have been laid before the Vestry, for no commercial company would enter upon such a work without being in possession of all the facts as to cost, &c. Mr. Thwaites (the former Chairman of the Committee) contended, on the other hand, that street lighting is an inducement for residents to adopt electricity in their houses. He said the result in the Finchley Road had been that shopkeepers either had to introduce electricity or improve their light by using incandescent gas-lamps. As to the cost, he would remind the Vestry that the Committee would pay their way this year, and undoubtedly make a profit next. He looked forward to the time when every street in the parish would be lighted by electricity, when the cost of producing the current would be "a mere nothing." Mr. Colley was not to be awed by these brilliant prognostications; and he asked whether the ratepayers were going to get £600 worth of extra benefit from the proposed additional expenditure of £620 a year. He could understand such an experiment had there been a large surplus of profit in hand. In reply, the Chairman of the Committee declared that, if full details were to be submitted to the Vestry, the utility of their Committees would cease. Private lighting in Hampstead, he added, had increased in a higher proportion than in St. Pancras. On the vote being taken, the amendment was lost by 22 to 28; and the Committee's recommendation was agreed to—the Chairman of the Vestry (Mr. Harben) pointing out that it was distinctly understood that, before the work was commenced, a plan showing the proposed position of the lamps would be presented to the Vestry.

Last week we recorded an extinction of the electric light in the City of London on the evening of the 29th ult., and an outbreak of fire in connection with the electric lighting apparatus at the Prince of Wales's Theatre on the same evening. Another extinction has now to be noted—the cause this time being water. Owing to the recent excessive floods in the Rhone Valley, the electric light works at Lyons were flooded, and on the night of the 2nd inst. gas had to be resorted to. At St. Peter's, Cranley Gardens, on Sunday, the 1st inst., the electric light, which had been installed for about three weeks, went out while a harvest festival service was in progress. The "Electrician" last Friday gave the following explanation of the mishap in the City: "Ferranti coils have been fitted to three of the Brush alternators; and while the other machines are being altered, the plant available for running is somewhat limited, and the running requires care. On Thursday [Oct. 29], the three Ferranti-Brush machines were running in parallel with some of the old plant, and some of the old coils failing, the reconstructed machines were called upon to do not only the additional work of supplying the circuits, but also of blowing out the cut-out of the damaged machine; and they did this work with so much eagerness that many fuses blew simultaneously."

The formal inauguration of the electric lighting works of the Bury Corporation was performed last Thursday, by the switching on of the current by the Mayoress (Mrs. J. Hall); and in the evening the centre of the town was illuminated. The buildings connected with the installation have cost about £5000, and the plant £13,500.

On the recommendation of the Special Electric Lighting Committee, the Lincoln City Council last Tuesday sealed a memorial to the Board of Trade for a Provisional Order, to give them authority to supply the electric light. A statement of the proposed capital expenditure showed that it was estimated at £17,000.

A curious, but by no means unique, experience has befallen the Governors of the Devon and Exeter Hospital at Exeter, in connection with the adoption of the electric light. Early in the year, they came to the conclusion that the lighting of the institution ought to be improved. It was represented that the renewal of the gas-fittings would cost as much as an installation of the electric light; and as this light was presumed to have advantages not offered by gas, it was

decided to put it in. An idea of the cost was given by "a gentleman from Cornwall;" and on his estimate the sum of £1159 was granted for carrying out the scheme. Then Dr. Fleming was consulted; and he came to the conclusion that the cost was under-estimated. This proved to be correct. Specifications were issued, and tenders invited, with the result that the lowest received was £993 13s. 9d. in excess of the Cornish gentleman's estimate. Indeed, it was stated at a meeting of the Governors a few days ago—when there were some rather painful explanations with regard to the increase—that this gentleman found he could not do what was required for the amount he had reckoned, and that his tender for the work was six or seven from the lowest. Having gone so far, however, the Governors appear to have thought it necessary to carry the scheme to completion. Instead of £1000, they have decided to spend more than £2000 on the work, and have given permission to a Committee to carry out the scheme at a cost of £2000, in addition to the considerable sum of money already spent upon it. Some of them were naturally anxious for an explanation of the increase of 100 per cent. in the cost of a scheme which was put forward in such glowing colours. The only answer was that Dr. Fleming advised that they should have everything of the very best. It was, indeed, claimed that a saving would be effected in putting in electric lifts instead of the hydraulic lifts originally contemplated. It is to be hoped, for the sake of the institution, which is a very useful one, that the subscribers will be satisfied with the assurance which was given at the meeting that in spending the money the Governors are "not only providing for the patients in the most efficient way, but are also providing a cheap light for the hospital, and are not spending money extravagantly in doing so."

If what transpired at the meeting of ratepayers held at Newmarket last Wednesday to consider the electric light question is to be taken as an expression of the opinion of the inhabitants generally, the project of the District Council has been effectually quashed. According to the report in a local paper, the meeting was one of the largest and most enthusiastic ever held in Newmarket. It was called by the four members of the District Council who had voted against the resolution of the Council to apply for a Provisional Order authorizing them to undertake the supply of electricity, and was thoroughly representative of all classes and sections of the ratepayers. The floor of the hall was packed; the gallery was crowded to excess; and a number of people stood at the doors, unable to find seats. This was a pretty clear indication of the interest taken in the question. Mr. W. B. Sheppard was called upon to preside; and he expressed the pleasure he felt in doing so. In opening the proceedings, he made a straightforward, temperate speech; concluding it with the advice to the ratepayers not to accept the electric lighting scheme. Mr. Rodrigo, who, it may be remembered, came out rather conspicuously as an opponent of the scheme at the meeting of the District Council at which the matter was first considered (see *ante*, p. 701), then moved the following resolution: "Whereas the Newmarket Urban District Council have resolved to apply for an Electric Lighting Provisional Order without previously seeking the advice of any electrical engineer, or otherwise obtaining full information on the subject, and also without giving the ratepayers an opportunity to express an opinion thereon; and whereas this meeting is of opinion that the said undertaking is of an exceedingly speculative character, and that any loss arising from the venture will fall upon the ratepayers; this meeting protests against the decision of the Council, and pledges itself to take whatever steps may be necessary to prevent an electric lighting venture being charged upon the rates." The reading of this resolution was followed by cheers and prolonged applause. He said that, as a ratepayer, and as one who had been born and bred in the town, he should be very sorry to oppose anything that would be a benefit to it; but the ratepayers could depend upon it that the electric lighting scheme, if adopted, would prove a failure. He would leave the matter in the hands of the meeting; but his personal feeling was that, if they accepted the scheme, they would be the greatest flats in the world. Mr. Carr said he had great pleasure in seconding the resolution. He was also pleased to have an opportunity of explaining the reasons why he had opposed the electric lighting scheme on the Council. Personally speaking, he had no objection to the electric light—it was no doubt a splendid light; but what he had an objection to was the Council gambling with the ratepayers' money—and the adoption of the scheme was nothing less. If, in the face of such a meeting as that which he was addressing, the Council went on with the scheme, he should be very much surprised. He hoped the resolution would be carried unanimously. Mr. R. Stephenson, J.P., the Chairman of the Gas Company, explained the position of the undertaking, and showed how, with increased business, the price of gas had gradually been reduced. In nineteen years, because the consumption had risen from 11½ to 46 millions, the charge had been lowered from 5s. 10d. to 3s. 10d. per 1000 cubic feet. This meant, he said, a total reduction to the ratepayers, upon last year's sales, of more than £4600 a year. The sliding-scale would bring the gain up to £6000. If the District Council carried out the electric lighting scheme, the ratepayers would lose in two ways—by the money thrown away in the venture, and by the thousands of pounds a year more they would have to pay than they would for gas. The first step in taking up the electric lighting scheme should be to engage an expert to report as to its prospects of success. The Council had not done that; they were going into the matter entirely unadvised. If people knew that the electric light would cost them seven times as much as the incandescent gas-light, they would never take it; but if they did, they would discontinue its use when they found what it cost. However, the matter rested with the ratepayers. The Chairman invited further remarks upon the resolution. Several cries were raised for Mr. Segrott; but this gentleman did not respond. The resolution was then put to the meeting, and almost everybody in the room held up his hand, and cheer after cheer was given. Votes against the resolution were then called for; and the Chairman said he could not see one. It was afterwards resolved to send a copy of the resolution to the Clerk to the District Council, with a request that it should be laid before the members at their next meeting. A vote of thanks was enthusiastically accorded to the Chairman for the manful way in which he had come forward to espouse the cause of the ratepayers. Another matter bearing upon the electric light question was disposed of last week. At the meeting of the District Council on Monday, the offer made by the Newmarket Gas Company to bear half the expense of engaging an expert to report upon the electric lighting scheme, which was before the Council at their previous meeting (see *ante*, p. 807), was under consideration. Mr. Carr said he thought the offer was a fair one; and he proposed that it should be accepted. Mr. Westley seconded the motion. Mr. Westrope moved, as an amendment, that the letter be acknowledged, and the Company informed that the Council did not see their way to accepting the offer. After a discussion, the amendment was carried.

One of the final official functions performed by Alderman F. T. Edridge in the capacity of Mayor of Croydon was the opening, on Friday last, of the new electric light station at Waddon. In the evening, the main streets were illuminated by means of electricity for the first time; the current being turned on by the Mayoress. The ceremony at Waddon was witnessed by most of the members of the County Borough Council and others. Professor Kennedy, who has been the expert adviser of the Corporation in this matter, predicted "greatly increased prosperity by reason of the innovation."

Heanor Water Supply Scheme.—The long vexed question of the water supply of Heanor has now been satisfactorily settled; and the future water supply of the district is considered to be well assured. A borehole has been sunk on land at Smalley, the owner of which is Mr. R. S. W. Sitwell; and the supply is stated to be both good in quality and plentiful in quantity. An agreement has been entered into with Mr. Sitwell, by which the Council are to pay him £50, and to lay mains and supply water to certain of his farms, at a cost of 4d. per 1000 gallons. The Council will also be able to furnish a supply to Smalley, Horsley, Woodhouse, and Denby.

Retford Corporation Gas and Water Undertakings.—In last week's issue, there appeared, on p. 870, an epitome of the annual report of the Gas Committee of the Retford Corporation. We since learn that the past year completed the eighteenth of the municipal control of the undertaking; and that the gross profit for the twelve months amounted to £3335, and exceeded by nearly £500 that of the preceding year. The sum of £1000 is to be paid over to the Corporation for the public benefit; and meter-rents are to be abolished at the close of December. Taking into consideration the unfavourable circumstances of the year so far as gas undertakings are concerned, this record is extremely satisfactory; and it reflects great credit on the management, and particularly on the Chairman of the Committee (Alderman Tomlinson) and the Engineer and Manager (Mr. J. B. Fenwick), who also holds the same position in connection with the water undertaking. The annual report of the Water Committee, of which Alderman Plant is the Chairman, has also been issued. It shows that the capital spent during the year amounted to £211, and that the account has been over-expended by £112. This the Committee propose to provide for out of revenue. It is recommended that the water supply should be improved, and further storage provided, by making a new and independent borehole, 330 feet deep, with a diameter of 15 inches for the first 25 feet, of 12 inches for the next 175 feet, and of 10 inches for the remaining 130 feet. The cost of the borehole is estimated at £350; and this, too, the Committee hope to be able to defray out of revenue. A sum of £3934 remaining due at the date of the last report to the Northern Counties Investment Trust, Limited, and bearing interest at 4 per cent. has been paid off; and £3800 has been re-borrowed from the Yorkshire Penny Bank at 3½ per cent. The water-rents for the year total to £2242, as compared with £2283; but, nevertheless, the private consumers have increased in number—the decrease in revenue being caused by the Railway Company having taken less water. The net surplus revenue, after paying interest and instalment on account of principal, is £590, as against £232 in the preceding year. The balance now standing to the credit of the revenue account is £1139. The Committee are providing water for the public baths free of charge; and they also propose, as from Jan. 1 next, to supply water to the streets without charge.

Quality of the Gas Supply of Lichfield.—For some time past, Lichfield has been much exercised with regard to the quality of the gas supplied by the Company. Recently the question was taken up by a newly-formed Tradesmen's Association; and a letter was addressed to the City Council, urging them to appoint an expert to test the quality of the gas, which, it was alleged, was of such inferior quality as to leave the city at times in semi-darkness. Such powers had never before been exercised by the Council; but it was resolved to call in Mr. A. Cresswell, of Edgbaston. His report was submitted to a special meeting of the Council last Tuesday; and it created (according to a reporter) quite a sensation among those members who are Directors of the Company. Mr. Cresswell said he found the photometer at the gas-works to be of an old and obsolete form, known as King's 100-inch instrument. It did not comply with the conditions laid down in the Gas-Works Clauses Act, 1871; and legal tests could not, therefore, be made with it. There was no candle-balance, the disc-box had no reflectors, there was no governor to the meter, no barometer, no screens were provided, and, finally, the photometer-room was too small. Irrespective of the fact that tests with such an instrument would not be in compliance with the Act, he did not consider that accurate values for the illuminating power of the gas could be obtained by its means. Alderman Biggs thought the Council should call upon the Company to secure a new and improved testing apparatus, at their own expense. Alderman Haynes (a Director) remarked that the instrument was quite sufficient for the purposes of the Company; and if the Corporation wanted another, they must provide it. Alderman Biggs said the consumers had to pay 3s. 4d. per 1000 cubic feet for gas of 14-candle power or less; while in other towns only 2s. 6d. per 1000 feet was paid for gas of 17 candles and more. Alderman Morgan (a Director) entered into a somewhat long explanation on behalf of the Company, stating that, by their statutes, they were only compelled to provide gas of 14-candle power, and that it was never supplied at less, but often as high as 16 candles. The present photometer was quite accurate; and he regarded the strictures passed on the honesty of the Directors of the Company as approaching a libel. Eventually it was resolved to ask the Company to consider the question of providing proper and up-to-date testing appliances.

ACETYLENE AS AN EXPLOSIVE.

[From the "Engineer."]

The employment of acetylene for illuminating purposes has been extending considerably in France during the past few months; and a large number of companies have been formed to exploit appliances which will permit of users manufacturing their own gas. The new illuminant has the more readily secured popular favour because the large consumer has long been looking for a more convenient and cheaper method of lighting than ordinary gas, petroleum, or electricity. It was believed that this had been found in acetylene, which gives a much greater illuminating power than ordinary gas; and as the cost of production is regulated entirely by the price of calcium carbide, it was held that, with the enormously extending manufacture of this material, the acetylene would, in course of time, become much more economical than any other form of illuminant. Besides, the fact that users would be able to manufacture their own gas led them to give an especially enthusiastic welcome to a system which would render them independent of the gas monopoly and the petroleum duties, and would enable them to secure a much greater lighting power at a smaller cost.

At the moment when consumers first began to show a predilection for acetylene, the question naturally arose whether the new gas was perfectly safe. It was known that under certain conditions it had an explosive force; but the makers of the different appliances for producing the gas claimed that, with the ingenious methods adopted for preventing any sudden expansion of gas, no danger whatever was to be feared. The scientists, too, who have been giving a good deal o consideration of late to acetylene, approved of the use of the gas, if sufficient care were taken in its employment; and, with a view to securing perfect safety, a series of rules and regulations have lately been put in force. In spite of these, however, the acetylene users have had their confidence severely shaken during the past few weeks by two explosions that have been attended with fatal results. First, an apparatus employed in a *café* at Lyons exploded, completely wrecking the premises, killing two persons, and injuring several others. More recently yet another accident took place, when a steel receptacle containing liquid acetylene exploded at the works of M. Raoul Pictet in Paris. A part of the works was blown down, two workmen were killed, and another injured, and not a pane of glass was left in the windows of the large block of buildings. The effect of the explosion was very much like that of dynamite. The unfortunate workmen were torn to pieces, and parts of their bodies were scattered about the yard. The flesh was blackened by a substance which had penetrated into the skin; and this has enabled the experts to formulate a plausible theory as to the cause of the explosion.

The significance of these two accidents lies in the fact that they have arisen from entirely different causes. At Lyons the explosion was occasioned by acetylene gas; but as the apparatus was entirely destroyed, there is no means of ascertaining how it had taken place. At the works of M. Pictet, the steel receptacle contained liquid acetylene, produced under a heavy and constant pressure. For some time past there has been a good deal of discussion as to whether acetylene in the liquid or gaseous state is preferable. By far the majority of experts are in favour of generating the gas in an apparatus. This is done by the automatic opening and closing of a tap which regulates the admission of water to the calcium carbide, so as just to keep the gasholder full. They maintain that this is a much safer means of utilizing acetylene than by liquefying it under pressure, and storing it in steel receptacles. In fact, many companies refuse to have anything to do with liquid acetylene, under the impression that the danger of handling it is too great. M. Pictet, on the other hand, is in favour of the liquid, as he argues that the danger arises solely from the impurities contained in the acetylene, and that these must be removed by special processes before the acetylene can be liquefied without leaving a residue. He contends that another enormous advantage lies in the convenient and portable form of the receptacles, which may be conveyed any distance ready for use, and will, in course of time, be purchased at any store as required. There is, he asserts, less danger to be feared from liquid acetylene than from liquid carbonic acid, for this latter will only liquefy under a pressure of 65 or 70 atmospheres, while acetylene requires a pressure of not more than 12 atmospheres. Nevertheless, there are two million carbonic acid cylinders circulating on the railways; and yet accidents from this cause are very rare.

The experiments that have been made by MM. Berthelot and Vieille, the Chief Engineer of the French Explosives Department, would seem to bear out some of the arguments of M. Pictet. They still show, however, that liquefied acetylene is more liable to explosion than the gas; and this has been repeatedly insisted upon by M. Berthelot, who has made several communications on the matter to the Academy of Sciences. They took two steel receptacles, each of a capacity of about a litre, and filled one with gaseous acetylene under a pressure of 10 atmospheres, and the other with liquefied acetylene with a density of 0·3—that is to say, of 300 grammes to the litre. The cylinders were dropped first of all from a height of 6 metres on to a steel anvil, and no explosion ensued. They were then broken by a hammer of 280 kilos. in weight, falling 6 metres. The compressed gaseous acetylene did not explode; but in the other cylinder an explosion took place after an almost imperceptible interval. This, it is supposed, resulted not from the pure acetylene, but from the mixture of the explosive impurities in the acetylene with the air the moment they were freed from the cylinder. The inflammation of this gas is believed to have resulted from the sparks flying from the pieces of the steel receptacle when it was broken. Then a wrought-iron bottle was taken enclosing another containing gaseous acetylene compressed at 10 atmospheres. It was fired at with a gun, and the ball penetrated the outer bottle and dented the inner one. No explosion followed the shock. A similar bottle was then filled with liquid acetylene, and a charge of 1·5 grammes of fulminate of mercury was fired inside. The bottle exploded with great violence; and the effects were exactly the same as with other explosives. It therefore appears that acetylene in its liquid form is much more liable to explode than in its gaseous state, even under a pressure of 10 atmospheres. It is, however, still a question whether the liquid employed in the experiments was absolutely pure, and whether, as M. Pictet says, there was not a residue of impurities that would facilitate an explosion.

M. Pictet claims that by his process the liquefied acetylene is absolutely pure. If this be so, his theory, as well as that of other experts, is shaken by the fact that one of his receptacles should have exploded. The gas is liquefied in a Cailletet cylinder, under a constant and uniform pressure—a condition which is held to be indispensable for transporting acetylene over long distances. These cylinders are made of nickel steel, and are tested to 250 atmospheres. The material used is so tough that a cylinder having a capacity of 12 litres does not weigh more than 21 or 22 kilos. In a receptacle of this capacity, it is only possible to put in 4 kilos. of liquefied acetylene, as some allowance has to be made for its enormous expansion. M. Pictet has had the idea that these cylinders would be sold in all the stores, and would be taken home by the consumers, and, after being fixed to a regulator, would be connected by pipes with the burners. The pressure in the cylinders would be sufficient to force the last drop of liquid into the regulator, where it would be volatilized. It was a receptacle of this description, though of much larger capacity, that exploded in the Paris works. In the form of a steel shell, it was about a metre in length, and had an aperture of only 3 millimetres, which was closed with a screw-plug. No one knows the exact state of the cylinder, but it is presumed that it must have been full at the time of the explosion. This is suggested by the fact that the substance which penetrated into the bodies of the unfortunate workmen is apparently a greasy bye-product that rises on the top of the liquid acetylene; and this grease can only be produced by a large quantity of the liquid. Consequently the cylinder must have been full.

The explosion is believed to have been caused by one of the hands closing the screw-plug, and then trying to open it again. A few minutes before the accident, a man from the engine-room close by entered the gasholder-room, and saw one of the deceased workmen screwing down the plug; and, as a spanner was found among the *débris*, it is presumed that he tried to unscrew the plug by this means, during the process of which he over-heated the metal to an extent sufficient to ignite the liquid. This is the opinion that has been formed by M. Charles Girard, of the Municipal Laboratory, who, in conjunction with M. Vieille, is about to draw up an official report on the accident.

This accident, and the many conflicting theories that are being put forward to explain it, show that the explosive character of acetylene in its different forms is still imperfectly understood. That danger exists in the storage of acetylene as a liquid, and in a lesser degree as a gas—as is proved by the unexplained accident at Lyons—there can be no doubt. This was lately recognized by M. Vieille, who promulgated a number of regulations for the use of acetylene. Under these rules, anyone employing an acetylene apparatus had to send a description of the installation, together with plans, to the Prefecture of Police; and, when once the sanction had been obtained, the user was bound to place the apparatus either in the open air or in a thoroughly ventilated and well-lighted room. It was not allowed under any circumstances to be placed in a cellar. Cylinders containing liquefied acetylene had to be put in the open air, and had to be covered with an outer envelope to protect them from the sun, at the same time that sufficient air space was left between the cover and the cylinder. Moreover, all the cylinders had to be submitted to official tests before they could be employed for the storage of liquefied acetylene. That these rules are not excessive, is proved by recent events; and it is evident that a further acquaintance with acetylene is needed before the new gas can be employed with absolute safety.

METROPOLIS WATER SUPPLY.

The London County Council and the Examination of Water.

In connection with the report, in the last number of the "JOURNAL," of the proceedings in the London County Council, on the 27th ult., on the subject of the examination of water by their Chemist (Mr. W. J. Dibdin, F.I.C., F.C.S.), reference was made to the "scare" caused by the publication of certain statements condemnatory of the London Water Supply, and to the views of Dr. E. Frankland in regard thereto. The Doctor's son—Dr. Percy F. Frankland, F.R.S., Professor of Chemistry and Metallurgy in Mason College, Birmingham, and an eminent bacteriologist—has since, in a letter to "The Times," attacked the conclusions arrived at by Mr. Dibdin and his colleagues, and brought the weight of his authority to the support of the existing system of examination. As he was the first to determine, now more than eleven years ago, the number of bacteria in the several waters supplied to London, and to make regular monthly reports to the Local Government Board on their bacteriological examination, he assuredly has a right to a hearing on this subject. He begins by pointing out that twenty years ago the public mind was harassed by the most contradictory assertions made by acknowledged authorities concerning the chemical quality of the water, while to-day the disagreement is over its microbial contents, and the evidence furnished by bacteriological examination. He then goes on to say it is now admitted on all hands that the fitness or otherwise of the Thames and Lea water supplied to London depends upon whether the processes of purification adopted at the works of the several Companies are efficient or inefficient in the removal of bacteria. This matter was discussed at great length by a number of experts before the last Royal Commission on Water Supply; and that the methods of purification were highly efficient in the removal of bacteria was attested by an abundance of experimental evidence furnished by Professor Ray Lankester, Dr. Percy Frankland, and others. The convincing character of their contention is, the writer says, shown not only by the favourable verdict of the Commission itself, but also by the complete *volte-face* of at least one prominent expert formerly well known as an unsparing critic of the London

Water Supply. He then continues: "The reassuring influence of the Royal Commission's verdict is now being disturbed by a series of reports which have been obtained by the London County Council from their own Chemist, as well as from Drs. Dupré, Klein, and Stevenson. These gentlemen make the sensational statement that the comparatively small number of bacteria found in London water by previous observers is altogether illusory, and that they themselves have found numbers enormously in excess of anything that has been hitherto recorded. Thus, Mr. Dibdin states that during the year 1891-2 the average number of bacteria found in the filtered waters of the Thames and Lea, as collected from stand-pipes in London, varied between 2299 and 4626 per cubic centimetre; Dr. Dupré again asserts even that some of the filtered samples he examined contained actually as many bacteria as the unfiltered water. Dr. Klein's results, if anything, are more startling still—finding, as he does, in some cases upwards of 40,000 and 50,000 bacteria in a cubic centimetre of the filtered waters." In view of the surprising character of these results the writer thinks it is necessary to approach them a little more closely, as there are certain points which demand a fuller explanation than is vouchsafed in the report. He then considers these points in detail as follows: "First, though in 1891-2 Mr. Dibdin finds in the water supplied by all the Companies most phenomenally large numbers of bacteria, in 1895 his results present a very remarkable contrast, for the numbers then found may be described as quite normal, and in substantial agreement with those which have been found on other occasions by myself and other observers. They fully confirm, moreover, my previous observations concerning the efficiency of the purification processes, by showing that out of 100 bacteria present in the unfiltered water 98·6 are removed in the process of purification. But over a part of the very same period of time—viz., during January and February of the same year—similar samples were being examined by Dr. Klein, with results utterly at variance with those obtained by Mr. Dibdin. Thus while the highest figure recorded by Mr. Dibdin in the filtered water during January and February is 838 in a cubic centimetre, Dr. Klein's figures run up to 10, 20, 30, 40, and even 50 thousand bacteria in the same volume of water. How two such entirely contradictory series of results can have been introduced into one and the same official report, without any explanation whatever being offered, is difficult to understand." It certainly is. Dr. Percy Frankland goes on to say: "A yet closer inspection of the results published shows that, in decrying the water of the London Companies, the report endeavours to prove too much; for in the water of the Kent Company, which is derived from deep wells in the chalk, and which is of a character which no antagonist of the existing Metropolitan supply has hitherto attempted to impugn, the same phenomenal numbers of bacteria are for the first time discovered by these investigators. There is, however, a similar, or even still more striking, inconsistency here again; for, while in 1891-2 Mr. Dibdin finds for the Kent Company's water unprecedentedly large numbers of bacteria (an average of nearly 5000 in a cubic centimetre) in 1895 his results are throughout normal; the average being 90 bacteria in a cubic centimetre—a figure agreeing very closely with those published in previous years in my monthly reports to the Local Government Board. Exactly, however, during the time when Mr. Dibdin was finding this normal bacterial population in the Kent water, Dr. Klein was discovering numbers of bacteria running up to 20,000 in a cubic centimetre." The writer concludes by saying that until the extraordinary discrepancies existing between the results obtained by the several experts consulted by the County Council have been explained to the satisfaction of scientific men personally acquainted with the technical difficulties attending the bacteriological examination of water, the public have no occasion to go behind the finding of the recent Royal Commission, based as it was upon the evidence gained by experience far more protracted, extensive, and profound than that which is produced in the present report.

Discussing Mr. Dibdin's report in its issue for the 31st ult., our new weekly contemporary, the "British Review"—the advent of which, under the editorship of Mr. W. H. Mallock, we have much pleasure in recording as a welcome addition to the high-class weeklies—made the following remarks: "By treating large quantities of water in an appropriate manner, Mr. Dibdin has found that there is some suspended matter, as any chemist would have anticipated that he would. But the only question of any importance to Londoners is, How much? Well, Mr. Dibdin finds that London water contains 0·0022 grain per gallon of matter which in absolute strictness ought not to be there. It would be an interesting imaginative exercise for our readers to get one grain of sand or chalk, and try to picture to themselves what this fraction of it really means. But if they want to see the fraction, they had better provide themselves with pretty powerful magnifying glasses. Mr. Dibdin, however, is exceedingly delighted with his discovery, and at once proceeds to a fascinating sum in the rule of three. If there is 0·0022 grain in one gallon, how much is there in all the water supplied to London in a year? Of course, it figures out to something considerable, taking the year's supply at 47,934 million gallons. But it does not look imposing enough to satisfy the proud discoverer; so with the odd remark that it will be more easily grasped as mud, he proceeds to convert it into mud by adding to it nine times its own weight of water. Then he announces with exultation that there are 67·5 tons of 'wet mud'—it is kind of him to say 'wet'—in the whole London supply of water for twelve months. Now, this sort of claptrap may be very good politics, but it is very poor science. It is of no use or value of any kind whatsoever, except to form the basis of an appeal *ad captandum vulgus*. The common man's horror is to be aroused by the statement that the London Water Companies deliver to him 67 cartloads of wet mud per annum, which he is meant to resent as if it were all shot down at his own doorstep. The sensation-mongers of the Press are to 'grasp' this mud, and fling it in the face of everybody who attempts to argue the water question. Just to show the futility and foolishness of the thing, we will take it the other way. Mr. Dibdin's figure 0·0022 means 1-500th of a grain per gallon; that is to say, if a man were to drink 1½ gallons from the tap every day for a year, he would at the end of this period have enriched his constitution with one whole grain of suspended matter. One pint a day is an extravagant allowance of raw water; and a man drinking a pint a day would have to drink for twelve years before he made up his one grain. Or if he began in his cradle and steadily drank a pint of London water a day till he reached the age of sixty, he would have got as much suspended matter from the Companies as would make a single ordinary pill. If Mr. Dibdin's analyses had been made and checked with ordinary care, he must have dealt with many thousand gallons of water in order to collect enough material. The difficulties of handling such a quantity with the delicacy and exactness required to give results to the 1-500th of a grain per gallon are very great. Mr. Dibdin professes to have obtained such results; but before receiving them with implicit confidence, we confess we should like an independent check. We should like it all the more because the monthly statements of the Chemists he seeks to discredit are based on duplicate examinations. The samples of water are analyzed in London; and similar samples are analyzed by Dr. Frankland at Reigate. No serious discrepancy could escape observation, whether it related to suspended matter, or bacteria, or anything else. Moreover, we know the history of these samples. They are taken in a scientific manner, in sterilized tubes, from the filter-wells of the Companies. The history of Mr. Dibdin's samples is not so respectable."

PROPOSED PURCHASE OF THE HARROGATE WATER-WORKS BY THE CORPORATION.

Parliamentary Powers to be Applied for.

The question of purchasing the water-works has been under the consideration of the Harrogate Corporation for some time past. The Water Company have had the control of the supply since 1846; and they secured increased powers by Act of Parliament in 1869. The gathering-grounds are at Haveran Park, situated a few miles from Harrogate; and the storage accommodation amounts to 179 million gallons. In consequence of the rapid growth of the town, it has become necessary to take steps to extend the works; and it was the intention of the Company to apply to Parliament for additional powers. The Corporation, therefore, thought that this was a convenient time to make an effort to get possession of the undertaking. Negotiations for the purpose have been entered into; and it is hoped that an amicable arrangement will be arrived at. The shareholders are entitled to a maximum dividend of 7 per cent.; and this has been earned with a good surplus. The matter of purchase was brought prominently forward at the recent municipal election; and last Friday week, at a meeting of the Town Council, it was resolved to promote, in the next session of Parliament, a Bill to empower them to effect the purchase, by agreement or compulsorily. To obtain the authority of the owners and ratepayers to proceed with the Bill, a meeting was held last Wednesday. The Mayor (Mr. D. Simpson), who presided, said it was essential to the prosperity of the town that the undertaking should be in the hands of the Corporation. It was his opinion that the Council should do everything they possibly could to come to an amicable arrangement with the Company before any measures of a compulsory nature were gone into. The Company had decided, from what they could gather, to apply to Parliament for extended financial powers; and the Corporation, as business men, thought that now was the opportune time, and that they should not allow the Company to obtain further capital without trying to come to some arrangement with them for the purchase of the undertaking. He moved the necessary resolution. In reply to a question, it was mentioned that the Corporation paid the Company rather more than £500 a year for water. The motion was unanimously adopted.

CAPE TOWN DISTRICT WATER-WORKS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held at Winchester House, E.C., last Wednesday—Mr. J. H. Durham (in the absence of Mr. J. S. Prince) in the chair.

The Secretary (Mr. G. H. Rippin) having read the notice convening the meeting,

The Chairman, in moving the adoption of the report, reminded the proprietors that last year the Cape Town Municipality found themselves face to face with a water famine and were compelled to take a supply from the Company, the value of which was £2490. This was an exceptional windfall, as the additional sources of supply, which were then in course of construction, were pretty sure to render Cape Town independent of outside assistance in the future. Deducting this sum, an increase of about £900 was shown in the revenue derived from private consumers. The income from this source continued to make good progress, which had been fully maintained since the close of the financial year on June 30. The lawsuit brought by the Claremont Municipal Council against the Company had been decided in favour of the latter. There had been an increase in the working expenses caused by the additional outlay incurred in maintaining in a state of efficiency a longer length of main. With regard to pumping and engine charges, economy had resulted from the triplication of the engines. The figures relating to this were as follows: In 1893-4, 95 million gallons pumped cost £1640; in 1894-5, 126 million gallons cost £1390; and in 1895-6 146 million gallons cost £1496—showing an increase of only £106 for 20 million gallons. The yield of the springs continued very satisfactory, and, notwithstanding two dry seasons, there had been no falling off in the supply. The net profit for the year had been £2717, which was increased by the amount brought forward to £3723, out of which the Directors proposed a dividend of 3¾ per cent., leaving £923 to be carried forward. On June 30 last, 2316 houses were served, out of a total of 3273 in their district, exclusive of the Woodstock Municipality, which was supplied in bulk. Of those unsupplied, 279 could receive a service of water without any further capital expenditure by the Company.

Mr. H. E. M. Davis seconded the motion; and it was carried unanimously.

A vote of thanks was accorded to the Chairman and Directors, and the local Board, Engineers, and staff in Cape Town.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week has seen the municipal elections in Scotland carried through. There was not, in any of the burghs, any prominent question relating to gas; and water scarcely figured as a subject of interest to the ratepayers. I observe that Lord Provost Sir James Bell, of Glasgow—who, by the way, has retired, after having held office for four years—stated, in his valedictory address, that there had been made a reduction in rates and in the price of gas, which would leave £50,000 more in the pockets of the citizens when compared with last year. In Glasgow, there was what was styled a general election; all the Council having come out, in terms of the Extension Act of 1891. There was quite a crowd of candidates; but, with the exception of one or two, all the old representatives who sought re-election have been returned. I think there were only two—the Lord Provost and another—who did not seek re-election. Mr. R. M. Mitchell has been re-appointed Convener, and Mr. W. Stevenson Sub-Convener, of the Gas and Electric Light Committee. In Perth, Lord Provost Dewar has been re-elected to office. In an address to the electors, he stated, among other matters, that to him there was no argument against the removal of the gas-works to a new site. At present they had to pay about £1000 a year for the cartage of coal, all of which would be saved in the new works; and, besides, the cost of the present site was £200 per acre, whereas that of the new site would be only £10 per acre. Bailie Wright, who has been for some years Convener of the Works Committee of the Gas Commission, has been returned to the Council, and will most probably be re-appointed to the convenery.

I mentioned a fortnight ago that the Dundee Town Council had resolved not to proceed in the next session of Parliament with a Bill which they had under contemplation, one of the objects of which was to be the enlargement of the borrowing powers of the Council in regard to the Corporation Gas Department. I suppose it may be on account of the circumstance that a considerable change has been made in the composition of the Council—five new members having been returned—that the proposal has been made that the Bill should be proceeded with after all. At the first meeting of the Town Council, held yesterday, Treasurer Ritchie gave notice of a motion to the effect that they resolve to promote a Bill giving them the powers previously proposed. Ex-Provost Brownlee asked if it were competent to so move, considering that they had recently resolved not to proceed. The Clerk pointed out that it was only the previous question which was adopted by the last Council. The notice of motion was accepted; and it is to be discussed on Monday.

The Gas Committee of the Dundee Corporation have resolved to improve the public lighting in various parts of the city, by the introduction of flat-flame burners, at a cost of about £50. They have also entered into a contract to supply 100 tons of sulphate of ammonia, at the price of £7 0s. 8d. per ton. A local newspaper makes the statement read as if the sulphate were to be supplied to the gas-works. It is not the first time I have seen such a blunder, which shows the very slipshod way in which intelligence is very frequently put before the public in news sheets.

Another incident which illustrates the same matter occurred at Forfar within the past week. The announcement was made in several newspapers on Monday, that a portion of the town of Forfar was in darkness on the preceding Saturday night; that lamps and candles were requisitioned; and that for a considerable time shopkeepers were put to much inconvenience. In some of the papers, the reminder was given, with a quite obvious intent, that a few weeks ago the Gas Corporation purchased a photometer, at a cost of £100, for the purpose of testing the quality of the gas. Another newspaper gave the occurrence as having taken place in Brechin, and explained it by saying that a workman who had been sent to turn on the water-main after repairs had been made, mistook the pipe, and turned off the gas instead of turning on the water. Another predicted that there would be more "gas rows" in Forfar. Those who published these statements were under the necessity of inserting, as they did on Thursday, an explanation of the occurrence by Mr. Forbes Waddell, the Manager of the Forfar Gas-Works. This was to the effect that there was an ample supply of gas all the night, but that a little air got into the plant during the completion of structural alterations. This reduced the quality of the gas in the lower parts of the town, but only to a small extent and for a short time; and other districts were not affected. It was added that six months ago the Corporation resolved, at the instance of the Manager, to purchase a photometer. The inference which I take from all this is that the newspaper scribes in Forfar know what takes with their readers, and give them it. One of the constant delights which some members of the Corporation carry in their bosoms is to depreciate the gas management; and anything in the slightest degree of the nature of a failure about the gas-works, gives them an unfailing text for a fresh agitation. The part of the newspaper is, therefore, not to give a plain statement of what happens, but to embellish it with some reflections suitable to the opposition—if not to exaggerate the whole affair. Accuracy is not of so much consequence as is the making of a "loud" paragraph. That was evidently what took place here. The next meeting of the Gas Corporation will show what the effect of it will be.

This week I attended a meeting in St. Andrew's Hall, Glasgow, and had occasion to note the effect which has been produced by the substitution of electric light for gas lighting. Not to speak of the somewhat amusing—otherwise at times very tantalizing—displays of rise and fall in the light, which were due probably to the plant being new, there was a very serious defect in the lighting, in respect that the entire ceiling of the hall has been lost to view. I remember a hotel keeper once telling me that he would not have a scheme of regenerative gas-lamps in his dining-hall because the ceiling would be concealed, and the effect of the general scheme of decoration would be destroyed. This is what has taken place in St. Andrew's Hall. The general scheme of decoration is a very effective one; but it is now not visible for much more than two-thirds up the walls. The lower part of the hall is in glare, and the upper portion in darkness. With gas, the whole was flooded with light. Unless some improvement is made, there is likely to be grumbling on the subject.

A most unfortunate result, to the patentee, has followed the raising of the action which I mentioned several months ago, by John Magee, Engineer, of Pembroke Street, Glasgow, against Tangyes Limited. Magee held letters patent, granted to himself in May, 1892, for improvements in gas motor engines; and on the allegation that the respondents were manufacturing and selling engines which were constructed in infringement of his patent, he sought to have them interdicted. Evidence in the case was led this week, before Lord Pearson; and the action was disposed of adversely to the complainer. I am afraid he acted rather unwisely, because I happen to know that he was advised by his Counsel not to raise the action. He, however, persisted; and the result was that he was unrepresented by Counsel at the trial, which was a severe handicap upon him. In his specification, he made many claims. The one which he alleged had been infringed had reference to the providing of means for the starting of the flywheel of the engine. Issue was joined upon this; and the complainer not only failed in his case, but the Judge also decided that the patent was invalid in respect of anticipation. The complainer has thus not only sacrificed whatever chance he might have had of having his invention taken up, but he has lost his patent as well.

Litigation which promises to be of interest to dealers in cannel is at present proceeding before Lord Low in the Court of Session. The pursuers are Messrs. James M'Kelvie and Co., of Haymarket, Edinburgh; and the defenders are the Arniston Coal Company, of Edinburgh. Messrs. M'Kelvie claim damages for alleged breach of contract, in respect that while they had an agreement with the defenders that they were not to supply Arniston cannel to the Bremen Gas Company, they did so. The defence is that the coal which went to Bremen was purchased as if for Hamburg; and that therefore the defenders committed no breach of contract. There are side issues in the case, relating to the qualities of coal, which, while the action remains undisposed of, I need not give. There have been two days' evidence already; and there will be at least one more.

A good deal is heard in the present day of the utility of deriving steam power from the waste heat of refuse destructors; and I understand it has actually been used in some places for this purpose. One of these is Edinburgh, where a destructor was built two or three years ago. I do not know to what extent the steam-raising plant has been successful; but so far as the destructor itself is concerned, it seems, though much care was bestowed upon the selection of the particular machine which would be best in the circumstances, not to have given satisfaction. There have been complaints from occupiers of adjoining properties, and more than one law case. In connection with one of these, the furnaces are at present undergoing considerable alteration, at great cost. It is estimated that in structural cost and law expenses, the outlay upon the one destructor has been about £26,000. Even after this great cost, it has not been made either efficient or up to expectation. The estimate was that it would deal with 80 tons of refuse per day, at a cost of about 10d. per ton; but it is impossible to get anything like good work out of it with more than 60 tons per day, and the cost is about 2s. 8d. per ton.

I have perceived a public contradiction, and I have also received private information, to the effect that the statement from the "Glasgow Herald" which I sent last week, relating to the formation of a large Coal Trust Combination in the West of Scotland, is without foundation. It is possible that one or two coal undertakings may combine; but the Syndicate will not be of the size, nor possess the power, which the writer in the "Glasgow Herald" seemed to anticipate.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov. 7.*

Sulphate of Ammonia.—It having transpired that much more extensive "covering" of speculative sales than those for October delivery had been done, and that this might mean the transfer of an important part of the speculative interest from the "bears" to the "bull" side, there has been, towards the close of the week, a sharp recovery in values, and considerable excitement in the market. The bulk of the covering referred to was done in London and in Scotland—November-December delivery, at £7 5s. to £7 7s. 6d. per ton, and January-June at £7 10s. to £7 17s. 6d. per ton, Beckton terms; and at £7 15s. per ton f.o.b. Leith. At the close, the quotation for January-June is about £8 5s. per ton; but this figure has checked the buying. Makers elsewhere have refused to sell ahead; but the activity in the forward position has reflected itself upon the spot market, and induced consumers to come forward up to £7 10s. per ton at the close. Quotations have, however, become very irregular—extreme prices having been paid for urgent "covering" orders, and makers, on the strength of these, are going in now for still higher figures. A few days will, no doubt, show whether consumers will follow the advance further, and whether, in the absence of consumers' orders, speculators will keep the ball rolling.

Nitrate of Soda is firm at 8s. per cwt. on spot for fine quality.

LONDON, *Nov. 7.*

Tar Products.—Although benzols are nominally quoted at prices below, there is no business doing; and buyers are waiting for lower quotations. There is no need for alarm in respect to these articles, as benzols are still undoubtedly scarce; and the consumption, both for colour making and other uses, is growing rapidly. Pitch is flat; and some makers are a little anxious as to future value. An important improvement has taken place in the value of carbolic acid; and it is not unlikely that higher prices even yet may be attained. A better feeling also pervades the creosote and tar oils market. The general improvement in trade will probably help these residual products, which have been languishing for some time. Distillers are now finding that they have latterly paid too much for tar, as, with the fall in the price of pitch and other important products, the sanguine anticipations of a few speculative contractors are not being realized.

Quotations during the week are: Tar, 18s. 6d. to 26s. 6d. Pitch, 28s. to 30s. Benzols, nominal, 90's, prompt, 4s. 3d.; forward, 3s. 10½d.; 50's, prompt, 3s. 1½d.; forward, 3s. Toluol, 2s. 3d. Solvent

naphtha, 1s. 6d. Crude, 30 per cent., naphtha, 1s. 2d. Creosote, 2d.; liquid, 2¼d. Heavy oils, 45s. Naphthalene, 65s.; salts, 32s. 6d. Cresylic acid, 10d. Carbolic acid, 60's, 2s. Anthracene, "A," 10½d.; "B," 8¾d.

Sulphate of Ammonia has recovered itself in a most magical manner. Whether this is due to the recent meeting of large manufacturers or to other causes cannot be said. Prices for prompt delivery are now: London, £7 15s.; Liverpool, £7 15s.; Hull, £7 12s. 6d.; Leith, £7 10s., all less 3½ per cent. discount. For forward delivery, 5s. to 10s. advance on these prices is offered.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The severe weather of the past week has decidedly briskened up the coal trade of this district; and prices with the present month are showing a strong hardening tendency. As yet, there is no actually general advance on list rates; but in many cases collieries are quoting advances of 6d. per ton on round coal, and concessions made during the summer to meet competition are for the most part altogether withdrawn. Collieries are now on practically full time; five days per week being the general average. At the pit mouth, the minimum quotations are now 10s. to 10s. 6d. per ton for best Wigan Arley; and 8s. 6d. to 9s. for Pemberton four-feet and seconds Arley. Engine fuel meets with a ready sale. There is generally no scarcity of supplies; and prices, except for slight advances obtained on contracts for next year's delivery, are without appreciable change. The shipping trade is fairly good, with a decided upward move on recent low rates; 7s. 9d. to 8s. per ton being now the average for ordinary steam coal, delivered at Mersey ports or on the Manchester Ship Canal.

Northern Coal Trade.—There has been an improved demand for Durham coal the last few days, especially for gas and bunker coals; but the inquiry for Northumbrian coal is decidedly less, as is usual at this time of year. Northumbrian steam coals are quoted at about 7s. 9d. per ton f.o.b.; and second-class steam, at 7s. 3d. Manufacturing coals are steady; but for forward delivery, contracts are being settled on the basis of 3d. per ton advance on the quotations for the present year. In the gas coal trade, the deliveries on contract are now very heavy indeed; and thus the margin for sale is small. The price of coal is therefore firmer all round; and in some instances it is higher. Generally, the quotation for best Durham gas coals may be given as from 6s. 9d. to 7s. per ton f.o.b. There is no alteration in the price of gas coke this week; but there seems to have been a rather larger shipment to Hamburg and some of the near Continental ports.

Scotch Coal Trade.—Trade for all sorts is good; but coalowners report that prices do not improve. Taken all over, the home consumption is exceedingly satisfactory; but the export trade does not augment in volume. Were this to take place, there would soon be an increase in prices. Meantime, the quotations are: Main, 6s. 3d. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s.; and splint, 7s. to 7s. 3d. The shipments for the week amounted to 159,145 tons—a decrease on the quantity in the preceding week of 12,689 tons, and on the corresponding week of last year of 5682 tons. For the year to date, the total shipments have amounted to 6,505,686 tons—an increase upon the quantity in the same period of last year of 224,881 tons.

Reductions in Price.—The Directors of the Bedford Gas Company have resolved to reduce the price of gas, as from Jan. 1 next, 2d. per 1000 cubic feet. The price of gas at Hayle is to be reduced 6d. per 1000 cubic feet from the same date.

Improvements at the Brighouse Gas-Works.—The tender of Messrs. Jonas Drake and Sons, of Halifax, amounting to the sum of £775, has been accepted by the Gas Committee of the Brighouse Corporation for the erection of four beds of retorts on the regenerator principle at the Birds-royd works.

Proposed Municipalization of the Lowestoft Gas and Water Works.—At a special meeting of the Lowestoft Town Council last Tuesday, it was unanimously resolved to promote a Bill to obtain power to acquire, by agreement or compulsion, the undertaking of the Lowestoft Gas, Water, and Market Company.

Disproportionate Charges for Public Lighting.—A remarkable difference exists in the Audenshaw district in the prices paid for public lighting. One portion is supplied by the Ashton Gas Company at 2s. per 1000 cubic feet, and the other by the Manchester Corporation at 2s. 9d. The District Council cannot see the reason for this difference; and they have petitioned the latter body to reduce their price to that of the Ashton Company.

Sales of Shares.—Messrs. Burnett and Sons, of Southampton, have sold 600 £10 new ordinary shares in the South Hants Water Company, at prices varying from £15 10s. to £15 17s. 6d. The average was £15 13s. 11d., compared with £15 7s. 8d. at the previous sale. Some £20 shares (7½ per cent.) in the Gravesend and Milton Gas Company, being a further portion of the capital authorized to be raised, fetched an average price of £34 12s. 6d. each; and another parcel of similar shares issued some time ago secured £34 15s. each. Some original £10 shares in the Eastbourne Gas Company have been sold at an average of £33 6s. each; and "B" shares have changed hands at £26 7s. 6d. each.

Popular Lecture on Gas and its Capabilities.—The Working Committee of the Lecture Council of the Royal Victoria Hall, Waterloo Bridge Road, were well advised in securing the services of Professor Carlton J. Lambert, M.A., F.R.A.S., of the Royal Naval College, Greenwich, to deliver a popular lecture on the subject of gas. This he will do to-night, when he will show his audience, with the assistance of lantern illustrations and experiments, what they can do with a pennyworth of this useful commodity. He will first tell them how gas is made and consumed, and then deal successively with slow and rapid combustion, luminous and atmospheric flames, the energy of combustion, the power obtained from explosive combustion, the gas-engine and its future, and the efficiency of gas for lighting, cooking, heating, and ventilating, as well as in metallurgy. The subject, in Professor Lambert's capable hands, should be both interesting and instructive.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 898).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	23–25	+1	4 4 0
100,000	10	„	7½	Do. 7 p. c.	17½–18½	..	4 1 1
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	108–110	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	10–10½*	..	4 15 3
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	100–103	..	4 17 1
200,000	5	29 May	6½	Bombay, Limited	7⅞–8¼	..	3 18 9
40,000	5	„	6½	Do. New, £4 paid	5⅞–6	..	4 6 8
380,000	Stck.	13 Aug.	12	Brentford Consolidated	285–290	..	4 2 9
210,000	„	„	9	Do. New	215–220	..	4 1 9
50,000	„	„	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
159,375	„	12 June	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	242–247	..	4 13 1
208,820	„	„	8½	Do. A Ord. Stk.	185–190	..	4 9 5
933,500	Stck.	28 Aug.	5	Bristol, 5 p.c. max.	127–132	..	3 15 9
420,000	20	15 Oct.	11½	British	56–57	..	3 18 11
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	22–23	..	5 0 0
71,000	10	„	8½	Do. 7 p. c.	19–20	..	4 5 0
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	10½–11	..	5 9 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	103–106	..	5 13 2
150,000	20	15 July	8½	Cagliari, Limited	29–31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	17–18	..	3 6 8
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57–59*	+2	5 0 8
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	341–346	..	3 18 0
165,000	„	„	10½	Do. New do.	255–260	..	4 0 9
165,000	„	12 June	4½	Do. 4½ p. c. Deb. do.	152–157	..	2 17 3
800,000	Stck.	12 June	13	Continental Union, Limited.	278–283	..	4 11 0
200,000	„	„	10	Do. 7 p. c. Pref.	220–225	..	4 8 11
51,600	Stck.	28 Aug.	14	Croydon Com'cial A 10 p. c..	315–320	..	4 7 6
163,400	„	„	11	Do. B 7 p. c.	250–255	..	4 6 3
535,000	Stck.	28 Aug.	5½	Crystal Palace Ord. 5 p.c. Stk	140–143	..	3 13 5
60,000	„	„	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
486,090	10	15 July	11	European, Limited	26–27	..	4 1 6
354,060	10	„	11	Do. £7 10s. paid	18–19	..	4 6 11
5,746,590	Stck.	13 Aug	12⅝	Gaslight & Coke, A, Ordinary	310–315	+7	4 0 11
100,000	„	„	4	Do. B, 4 p. c. max.	110–115	..	3 9 7
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	305–315	..	3 3 6
30,000	„	„	5	Do. F, 5 p. c. Prf.	147–152	..	3 5 9
60,000	„	„	7½	Do. G, 7½ p. c. do.	212–217	..	3 9 1
1,300,000	„	„	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	„	„	10	Do. J, 10 p. c. Prf.	305–315	..	3 3 6
476,000	„	„	6	Do. K, 6 p. c. Prf.	172–177	..	3 7 10
1,061,150	„	12 June	4	Do. 4 p. c. Deb. Stk..	138–143	..	2 15 11
294,850	„	„	4½	Do. 4½ p. c do.	150–155	..	2 18 0
908,000	„	„	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	29 Oct.	6	Hongkong & China Limited	12–13*	..	4 12 4

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
3,800,000	Stck.	14 May	12	Imperial Continental	222–227	+½	5 5 9
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk	108–110	..	3 3 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6–6½	..	4 12 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	113–116	..	4 6 2
250,000	100	„	4½	Do. 4½ p. c. Debs.	108–110	..	4 1 10
541,920	20	12 June	5	Monte Video, Limited	16–17	–½	5 17 8
150,000	5	29 May	8	Oriental, Limited	8½–9	..	4 8 11
135,000	5	„	8	Do. New, £4 10s. paid	7½–8	+¼	4 10 0
15,000	5	„	8	Do. do. 1879, £1 paid	1½–2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	102–107*	..	5 12 1
500,000	100	1 June	6	of Chicago } 2nd Do.	102–107	..	5 12 1
250,000	10	30 Sept.	10	San Paulo, Limited	13½–14½	..	6 18 0
5,475,000	Stck.	13 Aug.	5 10/20	South Metrop., 4 p.c. Ord.	143–147	+1	3 10 9
820,000	„	15 July	5	Do. 5 p. c. Deb. Stk.	171–174	..	2 17 6
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	265–275	..	4 3 7
60,900	„	„	8½	Do. B	180–190	..	4 9 5
170,380	10	29 May	10	Tuscan, Limited	13½–14½	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	100–102	..	4 18 0
				WATER COMPANIES.			
746,123	Stck.	26 June	10½	Chelsea, Ordinary	338–343	..	2 19 9
150,000	„	„	5	Do. 5 p. c. Pref.	177–182	..	2 14 11
160,000	„	„	4½	Do. 4½ p. c. Pref. Stk., 1875	160–164	..	2 14 10
175,785	„	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162–167	..	2 13 11
1,719,514	Stck.	15 Oct.	7	East London, Ordinary	220–225	+5	3 2 2
554,740	„	26 June	4½	Do. 4½ p. c. Deb. Stk.	163–168	..	2 13 7
225,000	„	„	3	Do. 3 p. c. Deb. Stk.	105–107	..	2 16 1
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	113–118	..	3 3 6
295,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150–155	..	2 11 7
708,000	Stck.	13 Aug.	12	Kent	335–345	..	3 9 7
160,000	„	„	7	Do. New, 7 p. c. max.	217–222	..	3 3 0
1,043,800	100	26 June	9½†	Lambeth, 10 p. c. max.	263–263	+8	3 10 10
406,200	100	„	7½	Do. 7½ p. c. max.	225–230	+2	3 5 2
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	148–153	..	2 12 3
500,000	100	13 Aug.	12 9/10	New River, New Shares	418–423	..	3 1 0
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	150–155	..	2 11 7
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	154–159	..	2 10 4
126,500	100	„	4	Do. Do. 7½ p. c. Max.	148–153	..	2 12 3
489,200	Stck.	„	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 6
1,019,585	„	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	148–152	..	2 12 7
1,155,066	Stck.	12 June	10	West Middlesex	318–323	..	3 1 11
200,000	„	„	4½	Do. 4½ p. c. Deb. Stk.	165–170	..	2 12 11

† Next dividend will be at this rate. *Ex div.

The Proposed Kent Water Board.—Last Wednesday, a conference took place of delegates from the various governing bodies in West Kent, to consider the resolution of the London County Council to bring forward next session a Bill to acquire the various water-works within the Metropolis. It was resolved, subject to the approval of the ratepayers in the districts affected, to again proceed with the Kent Water Board Bill; but it was the general feeling of the delegates that the London County Council would come to an arrangement so far as the Kent Water Company's undertaking is concerned.

The Gas-Works Purchase Question at St. Annes.—A meeting of the ratepayers of St. Annes was held last Tuesday to confirm, or otherwise, the decision of the Council to purchase the property of the Gas Company. The Chairman of the Council (Mr. Shepherd) presided, and spoke of the benefits which would accrue to the town if the works were purchased. He also stated that out of the 94 shareholders in the Company, only eight were ratepayers. It had been stated that £50,000 would have to be paid for the undertaking; but such a figure he declared was quite delusive. He moved that a Bill be promoted to empower the Council to acquire the works. Mr. Royle seconded the motion. There was considerable discussion on the subject; and, in the course of the proceedings, Mr. E. H. Stevenson, the Engineer consulted by the Council, answered several inquiries by ratepayers. He adhered to a statement in his report that the Company had acted illegally; but the Council could not obtain power to compete against them. He was perfectly certain that the cost of procuring the works, and he would say the expenses of obtaining the Act included, would not amount to £37,000. The resolution was carried by 41 votes to 31; and a poll was demanded.

Supply of Water in the Dover District.—In the "JOURNAL" a week or two ago, reference was made to an important discovery of water at Dover. Mr. E. Easton, the Engineer to the Dover Undercliff Reclamation Scheme, now writes in connection with the discovery: "At Martin, the men who were driving the tunnel at the bottom of the well struck a new fissure which delivered such a quantity of water that it compelled them to leave their tools behind them and get to the surface as soon as they could. After five and a half hours' continuous pumping at full speed, there was still 6 inches depth of water in the heading. In fact, there is sufficient to supply the present wants of the whole district. The water issues from fissures in exactly the same way that I have before found at Ramsgate, Deal, Brighton, and other places, and is derived from the same rainfall and gathering area which supplies the great flows of water on the shores between Dover and St. Margaret's Bay. These I have measured on many occasions during the past four years, and have found them giving from 5 to 6 millions of gallons daily, or five to six times as much as is pumped to the whole town of Dover. The tunnels at present driven are only 6 feet in length; and as the Water Company have arranged with the freeholders to have the right to extend them to a length of at least 1000 feet, there is no doubt as to their obtaining enough water for any possible extension of building that may take place in their district. It only remains to raise the amount of capital necessary for distributing the water; and this is being taken in hand energetically by some prominent water consumers in the district."

The Freezing of Water-Mains in the Metropolis.—In connection with memorials they have received on the subject, the London County Council are seeking to obtain from the local governing bodies information as to whether the mains in their respective districts were frozen two years ago, whether the mains have since been lowered, and particulars as to their present depth. The Chairman of one local authority describes this as "a rather tall order."

The Torrington Corporation and the Water-Works.—It is probable that arrangements will be concluded for the sale of the Torrington Water-Works to the Corporation. Complaints have been made of the unsatisfactory nature of the supply, and the Water Company seem not unwilling to hand over to the Corporation the responsibility of improving it. At a meeting of the Town Council on the 30th ult., a letter was received from the Company stating that a Committee had been formed to confer with the representatives of the Corporation as to the sale of the works. The Council appointed a Committee to carry on the negotiations, and empowered them, if necessary, to obtain professional assistance in the valuation of the undertaking.

Maidstone Water-Works Purchase Question.—The ratepayers and owners of Maidstone have declared in favour of the purchase of the water-works by the Town Council, and have given their consent to the promotion of a Bill for conferring the necessary powers on the latter. At the town's meeting, a great deal of information concerning the position of the undertaking and its prospects under corporate management, was laid before the ratepayers by Mr. Cox. He stated that for the last seven years, the Company had been paying an average dividend of £8 13s. 2½d. on the 10 per cent. shares, and £6 2s. 7½d. on the 7 per cent. shares. Under the most favourable scheme, the Corporation would have to pay £187,203 for the works, costs, &c.; and the outside figure he estimated at £195,000. He was prepared to say they could raise this sum at 2¾ per cent., which, with the sinking fund for sixty years, worked out to £3 8s. 5d. per cent.; and the total cost to the borough would be £6670 per annum. From the balance-sheet of the Company for the year ended June last, he found that the profit balance was £5494. Adding various charges, which would be saved by the Corporation, the amount would be increased to a sum just under £6000, against the requisite £6670. There was thus a deficiency of slightly more than a penny rate; but he asked the ratepayers to consider that the income of the Company at present was derived from a portion of the borough only. The water-rents at present were equal to 1s. 3d. or 1s. 4d. in the pound; and assuming that the Council levied a 1s. 3d. rate, the amount raised would be £9375. Adding to this the cost of the water used by the Council, £500, and £2000 as an extra charge for water used in manufactories at so much per gallon, they arrived at a total income of £11,875. There would in this way be an absolute profit. The Mayor (Mr. J. Barker) wound up a long discussion by criticizing the proposal from the financial standpoint. He said that, if the works had been purchased twenty years ago, it would have been an admirable thing for the town; but if the ratepayers were not prepared to pay a 5d. rate for the next 25 years, they could not afford to entertain the proposal now. The resolution confirming the action of the Council was carried by 52 votes to 18; but a considerable proportion of those present did not vote A poll was demanded.

New Condensing Stoves.
Nos. 770 & 771.

GAS-FIRE SEASON 1896-97.

BEFORE ORDERING, SEE OUR

NEW DESIGNS.

UNEQUALLED,

UNAPPROACHED, AND

WITHOUT IMPERFECTION.

LISTS, ON APPLICATION, FROM

JOHN WRIGHT & CO. LIMITED,

BIRMINGHAM & LONDON.

THE OLDEST AND LARGEST GAS-STOVE MAKERS IN THE WORLD.

The Proposed Purchase of the Fylde Water-Works by the Local Authorities.—The representatives of the local authorities in the Fylde district, combined for the purpose of carrying out the purchase of the undertaking of the Fylde Water Company, have resolved to submit to arbitrators the question of price to be paid. Several members of the Joint Committee favoured the seeking of compulsory powers; but, if arbitration is agreed upon, a good deal of expense will be saved.

The Proposed Extension of the Blackpool Gas Supply Area.—There was a long discussion at a meeting of the Fylde District Council on the 4th inst. in regard to the application of the Blackpool Corporation for a Provisional Order extending their gas supply area so as to include the townships of Bispham and Carleton. It was stated that the ratepayers in the first-named place had decided to oppose the application; but as to the latter, the residents had expressed a wish to have the gas, but declined to tie their hands in any way. Ultimately, the matter was left to a small Committee, who will take the proper action for opposing the application of the Corporation.

Winding Up of the Shoreham Water Company.—The Shoreham Water Company, who sold their undertaking to the Brighton Corporation, have held their final meeting. The Corporation paid £11,675 for the undertaking; and part of this sum was invested in stock, leaving £6672 available for distribution. This has been devoted to paying a dividend at the rate of 5 per cent. per annum on the preference shares, one at the rate of 4 per cent. per annum on the amount paid up of the new preference shares, one of 5 per cent. for the half year on the ordinary shares, one of 3½ per cent. for the half year on the new ordinary shares, and the Directors' and Auditors' remuneration for the half year; leaving a balance of £5972. This has been used in the payment of the Directors' back fees (£696), and of certain gratuities; among them being one of £25 to Mr. J. J. Frampton, the Secretary, and another of £250 to Dr. Fuller, the Chairman. The balance is to be distributed among the holders of ordinary shares.

Position of the Bay State Gas Company.—In the "JOURNAL" for the 20th ult., we quoted a statement from the Money Article in the "Standard" of the previous day to the effect that Receivers had been appointed for the Bay State Gas Company of New Jersey—an undertaking incorporated in 1889 mainly for the purpose of consolidating the fourteen gas companies supplying Boston. In addition to obtaining control of all the Boston Companies, the Company subsequently absorbed the Brookline Gas Company at a cost of about $125,000. The financial statement on Jan. 1 last was as follows: Capital stock, $15,000,000. Funded debt, Boston United Gas first mortgage sinking fund, gold, fifty years, $500 bonds, due Jan. 1, 1939, issued $9,000,000; Boston gas second mortgage, gold, $500 bonds, due Jan. 1, 1939, issued, $3,000,000; Bay State Gas income, 7 per cent., $1000 bonds, due 1899, issued $2,000,000. Total stocks and bonds issued, $29,000,000. The appointment was made by Judge Wales, in the United States Circuit Court at Wilmington (Del.), on the complaint of Mr. W. Buchanan, of New York, a stockholder to the extent of $100,000. We learn that the proceedings were entirely *ex parte*; Mr. Addicks not being present.

Lighting of Crowland.—By four votes short of the necessary two-thirds majority, the town of Crowland (Lincs) has refused to adopt the Public Lighting Act; and it is stated to be the only place of its size in England with streets in darkness at night.

Extensions at the Guildford Gas-Works.—Messrs. John Aird and Sons are carrying out the concrete foundations for the new purifiers and steel gasholder tank shortly to be erected at the Guildford Gas-Works; Messrs. Westwood and Wrights have secured the contract to supply new boilers; and Mr. Maurice Schwab is to erect one of Wilton's patent sulphate plants.

Public Lighting by Incandescent Gas-Burners at Darwen.—At a recent meeting of the Lamps Committee of the Darwen Corporation, a report was read from the Gas Engineer and Manager (Mr. A. H. Smith), giving the results of some tests made by him with incandescent gas-burners on public lamps. With the permission of the Chairman of the Committee, he ordered two-light cluster burners, and fixed five in the large lamps at the Circus. Each of the burners consumes 7 cubic feet of gas per hour, and gives a light equal to 120 candles; while the cluster of three ordinary burners, as at present used in the remaining large lamps, consume 15 cubic feet of gas per hour, and give a light equal to 55½ candles. There is thus a saving of 8 cubic feet per hour per lamp with the incandescent system, and an increased illuminating power of 64½ candles. The Manager considered this very satisfactory. He also submitted a statement of twelve months' comparison of cost, showing a saving of nearly £56 8s. 7d. in favour of incandescent gas lighting. It was resolved that a further trial of the system should be made, for three months at least, in certain streets. It is intended to put up nine two-light, and five three-light clusters, and 40 single burners.

Mr. W. Whatmough on the Economic Use of Gas.—The winter session of the Heywood Literary Society opened well a few evenings since with a lecture by the Corporation Gas Manager (Mr. W. Whatmough) on the "Economic Use of Coal Gas." He had a large audience; and we are quite confident that the majority of them left the building much wiser than they entered it in regard to the methods and appliances for using coal gas. The lecturer pointed out that from 20 to 25 per cent. of the gas consumed is wasted, so far as giving light is concerned, owing to the improper way in which it is burned. He explained the various causes which lead to an increase or a diminution of a gas-flame—irregular pressure being one of them; and he showed the value of governors. Dealing with the burners which give the best light, Mr. Whatmough said the incandescent was the highest and best type; then there came the argand burner and the regenerative lamp in the order of merit. A globe, if of the right type, and placed in its right position relative to the light—viz., with the bottom of the globe on a level with the top of the burner—would be of assistance to the flame. The advantages of the much abused gas-meter were set forth; and it was shown how it could be made to tell whether or not the fittings were perfect, and enable the consumer to ascertain his indebtedness at a glance. In the concluding part of his lecture Mr. Whatmough dwelt upon the use of gas for cooking and heating.

RICHMOND & CO., LTD.,

WARRINGTON & LONDON.

THE "DRAGON."

New Pattern. Season 1896-7.

ADVANTAGES:

1. It is **very hot and incandescent** in a few minutes.
2. Most ornamental in design, and **beautifully finished.**
3. **New Duplicate Hot-Air Chamber joined by four tubes,** secures all duty possible from gas consumed, **giving 574 sq. in. of heating surface.**
4. Vaporizing pan at bottom of Stove **overcomes complaint of dry heat.**

PRICES.

1485	45s.
1487	55s.
1489	65s.

London County Council and Street Subways.—At the meeting of the London County Council last Tuesday, the Highways Committee reported that in January last the Council referred to them to consider and report on the expediency of application being made to Parliament for powers for the Council and the Local Authorities to construct subways under streets. Mr. Emden had submitted plans, showing the way in which he proposed that the subways should be constructed, together with estimates of cost. The Sub-Committee's estimated cost was £46,000 a mile; but that of Mr. Emden was £98,208 a mile. This, however, allowed for a very elaborate system of subways, and also of occupation vaults on either side of the road, for which he considered an annual rental of £2930 a mile might be obtained. In addition to this, he reckoned on a recoupment of £1012 per mile per annum from payments by the water, gas, and other companies for the use of the subways; making a total estimated return of £3942 a year. The Committee could not but think that he had taken too favourable a view of the amount of recoupment; and, apart from the fact that the proposal, if submitted to Parliament, would probably encounter as fierce opposition from the various companies as was offered to the more limited proposal of the Council in 1890, the Committee were of opinion that the time was inopportune for advising the adoption of a scheme of such magnitude as that suggested by Mr. Emden. With this opinion the Parliamentary Committee concurred. The Committee therefore recommended that the reference be discharged. Mr. Westacott asked that the report might stand over, as Mr. Emden wished to make some explanations; and the Council agreed to this.

Draycott Gas Company.—The value of energetic action in developing a gas undertaking is exemplified in the case of this Company, a few particulars in regard to which have just reached us. The works were built in 1887; and an Act of Parliament was obtained in the following year. The paid-up capital was, and still is, £10,000 of 10 per cent. stock under the sliding scale. The additional capital is £10,000 of 7 per cent. stock, with borrowing powers to the extent of a further £5000; but no debentures or additional capital have been issued. The district of the Company includes Draycott, Breaston, and Shacklecross, and part of Sawley and Wilne. From 1888 to the spring of the present year, no progress was made. The works were very indifferently managed; and no effort was made to increase the consumption. Last year the sales were less than two millions; and the price was 4s. 6d. per 1000 cubic feet. In April last, the whole of the shares in the Company were acquired by Messrs. Derbyshire Bros., Chartered Accountants, of Nottingham. Mr. J. N. Derbyshire took the office of Secretary, and at once began to develop the concern. Mr. F. C. Humphrys, the Gas Engineer of the Ilkeston Corporation, was appointed Consulting Engineer, with instructions to make the works thoroughly efficient. The manufacturing plant was thoroughly overhauled; the distributing plant received careful attention; and an effort was made to obtain new consumers—the first step being a reduction of the price to 4s. A gas exhibition was held in the summer by Messrs. John Wright and Co., with the result that about a score of cookers were let out on hire. The Midland Railway Company agreed to be supplied at their Sawley Station, and upwards of half a mile of mains had to be laid in consequence. A careful inspection of the district was made, when it was found that several gas consumers had small plants of their own, which were all old, and gave very poor results. A firm of cotton gassers at Wilne, who were making their own gas, were approached; and eventually they agreed to be supplied by the Company, and to discard their plant. The main (about three miles in length) is being laid by Messrs. J. and H. Robus, of London, and is expected to be finished by the end of this month. The opening of the Simpson Lever Chain Bicycle Works at Draycott this year gave a great impetus to that township. More than a hundred houses are now being erected; and these are being supplied through prepayment meters. Curiously enough, these works, which are in an old cotton-mill, have also their own gas plant. As large quantities of gas are used for enamelling and brazing, their consumption is several million cubic feet per annum; and they have now agreed to be supplied by the Company. They have also decided to do away with their present steam-engine, and put in five gas-engines, so as to work each shop separately. The parish of Draycott has just adopted the Lighting and Watch Act after a poll. The figures were: For gas, 138; against it, 35. Twenty incandescent lamps are to be erected. The whole of the officers of the Gas Company have been working at high pressure, especially the Manager (Mr. J. G. Salmon), who has been indefatigable in his efforts to push business. It is confidently anticipated that next year the sales of gas will be many times the 1895 figures.

GWYNNE & BEALE'S

PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

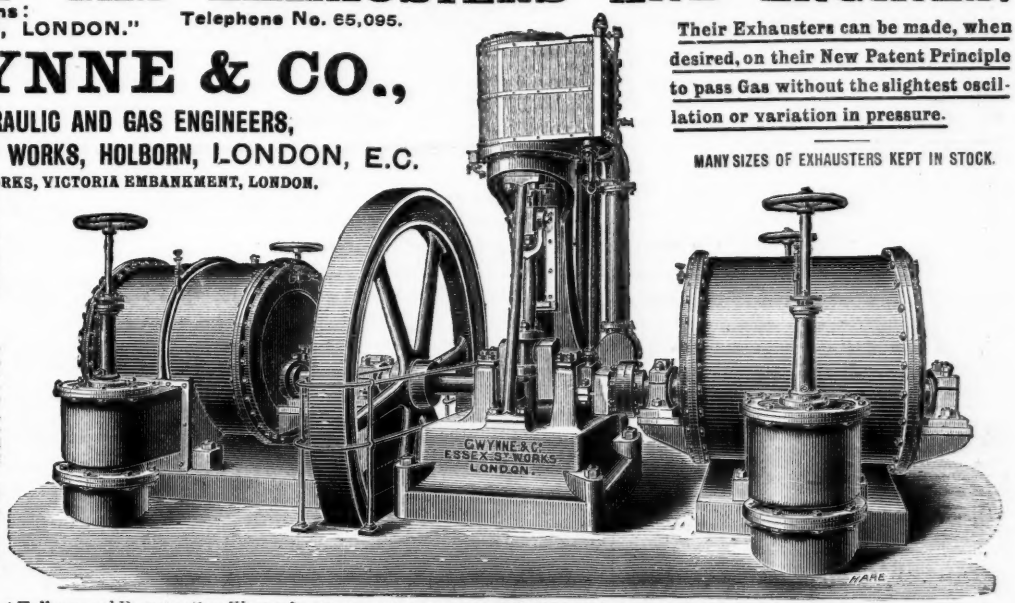
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

Telegrams: "Volcanism, London."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

Telegraphic Address: "PORTER LINCOLN."

[For Illustrated Advertisement see Nov. 3, p. 830.]

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c.

120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E. and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application.

70, CHANCERY LANE, LONDON, W.C.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

SALESMAN of 20 years' experience, accustomed to call on Gas Managers and others at home and abroad, speaking three Languages, desires appointment as TRAVELLER or RESIDENT AGENT of Colliery, of Pipe Foundry, or of Gas Plant Manufacturers.
Address No. 2739, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, two good Stokers used to Shovel Charging. Must be steady and industrious. Wages 30s. to 32s. per week.
Apply to S. BARK, Gas-Works, GODALMING.

WANTED, by the Hemsworth Gas Company, a Second-hand STATION METER, with 6-inch Connections.
State full Particulars, and where to be seen, to CLAYTON, SON, & CO., LIMITED, LEEDS.

WANTED, a Gentleman to take orders for Gas Apparatus, &c., on Commission in the Midland and Southern Counties. One having a good connection with Gas Companies and Gas-Fitters preferred.
Address, with References, No. 2737, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REPRESENTATIVE, with connection in Gas Coal, required by well-known London Firm, and to take supervision in absence of Partners. A Gentleman with knowledge of Seaborne Gas Coal preferred.
Communications will be treated in strict confidence.
Apply, by letter, to No. 2741, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for a Provincial Gas-Works, a thoroughly efficient CLERK. Age not to exceed 30 years. Must have experience of Coke Cash Sales, Time Book, Fittings, &c., &c. Security for £100 in an approved Guarantee Office required.
Applications, in own handwriting, stating Age, Experience, and Salary required, enclosing not more than three recent Testimonials, to be addressed to No. 2742, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Manager, for Works in New Zealand. Age not over 40 years. Must have thorough knowledge of the Manufacture of Gas and the Management of Gas-Works; also of modern methods of Purification, and the treatment of Residuals. Must be capable of designing and superintending alteration and enlargement of Works. Annual output of Gas about 150 million cubic feet.
Address, giving full Particulars of Experience, and Salary required, JOHN TERRY AND CO., 7, Great Winchester Street, LONDON, E.C.

GAS TAR and Ammoniacal Liquor Wanted.
Apply to JOSIAH HARDMAN, Milton, STAFFS.

OIL-GAS BENZOL for Enriching Coal Gas. A few Thousand Gallons to dispose of.
Apply, by letter, in the first place, to No. 2714, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SADLER & Co., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making Kerosene, &c.
Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.
VICTORIA PAINT WORKS.
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

SULPHURIC ACID for Sale (B. O. V. and R. O. V.) made from Spent Oxide.
The EXECUTORS of the Late JOSIAH HARDMAN, Chemical Works, Milton, STAFFS.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

ECONOMY IN PURIFICATION.

INCREASE the Efficiency of your PURIFIERS by adopting CRIPPS'S PATENT BYE-PASS VALVE in the lower Tiers of Sieves. Practical Experience proves their Economy. Engineers are repeating orders after thorough trial.
References and Particulars can be obtained from the Makers—
C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP.
And J. EVERY & SON, Phœnix Iron-Works, LEWES.

It is Worth Your While to Buy DIRECT.
THE RELIANCE LUBRICATING OIL COMPANY SUPPLY on APPROVAL "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Liquids for Gas Making, Enriching, &c.
RELIANCE LUBRICATING OIL COMPANY, WATER LANE, GREAT TOWER, LONDON, E.C.
Depôts at Liverpool, Bristol, Hull, Glasgow and Newcastle-on-Tyne. Telegrams: "Subastral, London."

WANTED, Second-hand Gasholders, 50 feet and 60 feet diameter, with Iron Tanks preferred.
Address offers to No. 2738, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Plant, both new and second-hand, ready for delivery, including Retort-Fittings, Condensers, Exhausters, Scrubbers, Purifiers, Meter, Governor, and Gasholder. **Inquire Price and Particulars before ordering elsewhere.**
J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

RETORTS AND FIRE-BRICKS.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company are prepared to receive TENDERS for the supply of about 1550 feet run of FIRE-CLAY RETORTS, 40,000 FIRE-BRICKS, and 60 tons of CLAY.
Specification and Form of Tender may be obtained from the undersigned, to whom tenders, endorsed "Tenders, &c.," must be delivered on or before noon of Thursday, the 19th of November, 1896.
J. M. VEEVERS,
Engineer and Secretary.
Gas Offices, Rochester,
Nov. 5, 1896.

CITY OF MANCHESTER.

TENDERS FOR CAST-IRON PIPES.

THE Gas Committee are prepared to receive, on or before the 18th inst., TENDERS for the supply of about 700 Tons of CAST-IRON PIPES, of 3 inches, 4 inches, and 8 inches diameter.
Specifications and Forms of Tender may be obtained on application to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.
By order,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
Nov. 6, 1896.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for about 374 feet of Stourbridge or other approved quality FIRE-CLAY RETORTS, 22 in. by 16 in., 12,000 FIRE BRICKS, TILES, and 10 Tons of CLAY.
Tenders to be sent in on or before noon, on Monday, the 16th of November, 1896, addressed to the Chairman of the Gas and Water Accounts Committee, Hardres Street, Ramsgate, endorsed "Tender for Fire-Clay Goods."
Specification and full Particulars on application to
WILLIAM A. VALON,
Engineer.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

Fourth Edition, Revised and Enlarged.

DESTRUCTIVE DISTILLATION: A Manualette of the Paraffin, Coal Tar, Rosin Oil, and kindred Industries. By PROFESSOR E. J. MILLS, D.Sc., F.R.S. *Imp. 8vo., 5s.*
LONDON: GURNEY AND JACKSON.

HAWORTH URBAN DISTRICT COUNCIL.

TENDERS are invited for the purchase of the Council's surplus TAR and LIQUOR for the Year ending Dec. 31, 1897, delivered on Rails at Haworth Station.
Tenders to be sent to me not later than the 25th of November.
WILLIAM ROBERTSHAW,
Clerk.
Burlington Chambers, Keighley.

WIMBORNE MINSTER GAS AND COAL COMPANY, LIMITED.

TENDERS FOR NEW GASHOLDER, ENGINE, EXHAUSTER, &c.

THE Directors of the above Company invite TENDERS for GASHOLDER and TANK GAS-ENGINE and EXHAUSTER, &c.
Plans and Specifications may be seen at the Offices of the Company, Leigh Road, Wimborne, Dorset.
Tenders to be delivered on or before Thursday, the 26th of November inst., at the Company's Office.
The Directors do not bind themselves to accept the lowest or any tender.
GEORGE F. STRANGE,
Chairman.
Nov. 4, 1896.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 3rd inst.
THOMAS HENRY GOODWIN NEWTON, Esq., in the Chair, when the following RESOLUTIONS were unanimously passed:—
"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."
"That a Dividend of 5 per cent. for the Half Year ended the 30th of June last, and a Bonus of 1 per cent., be declared upon the £3,800,000 Capital Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 10th of November next."
"That the cordial thanks of the Meeting be given to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the Chair this day, and to the Staff in London and on the Continent."
By order of the Board,
ROBT. W. WILSON,
Secretary.
21, Austin Friars, London, E.C.,
Nov. 4, 1896.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.
He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.
Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.
Offices: 18, FINSBURY CIRCUS, E.C.

GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Nov. 24, at Two o'clock precisely, in Lots, the following high-class Investments:—
ALDERSHOT GAS AND WATER COMPANY (a new issue by order of the Directors)—200 £10 Five per cent. Preference Shares.
GRAYS GAS COMPANY, LIMITED—141 £10 fully-paid Shares.
WORTHING GASLIGHT AND COKE COMPANY (a new issue by order of the Directors)—200 £10 Shares.
CRAYS GAS COMPANY—96 £10 fully-paid Shares.
CRYSTAL PALACE DISTRICT GAS COMPANY—£2000 Five per cent. Stock.
HARROW AND STANMORE GAS COMPANY—110 £10 Shares.
KING'S LYNN GAS COMPANY—£550 Original Stock.
CROYDON COMMERCIAL GAS COMPANY—£75 "B" Stock.
Particulars of the AUCTIONEER, 18, Finsbury Circus, LONDON, E.C.

MICHAEL AND WILL'S Law of Gas, Water, and Electric Lighting. Fourth Edition. Entirely re-written by J. SHIRESS WILL, Esq., Q.C. *Royal 8vo.* 1894. *Price* 32*s.*, *Cloth*; *for Cash, post free,* 26*s.* 6*d.* "The Standard book on the subject."—"Local Government Chronicle."
BUTTERWORTH AND Co., 7, Fleet Street, LONDON, E.C.

Now Ready, Price 15*s.*, *Limp Cloth, the Sixteenth Yearly.*

ANALYSIS OF THE ACCOUNTS
OF THE
Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to Gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the Year ended December 31, 1895, or March 31, 1896, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the Year ended December 31, 1895.

Compiled and arranged by
ALFRED LASS, F.C.A.

LONDON:
WALTER KING, 11, Bolt Court, Fleet Street, E.C.

Just Published, with 207 Illustrations, 8vo. Price 10s. 6d.

A PRACTICAL TREATISE
ON THE
"OTTO" CYCLE GAS-ENGINE.
By WILLIAM NORRIS, M.I.MECH.E.

This work is intended to furnish Engineers, Draughtsmen, and Students with practical data, based as far as possible on the results obtained, after years of experience, by the leading Makers of the Gas-Engines which work on the common and well-known four-stroke Cycle of the Beau de Rochas and Otto.

LONDON:
LONGMANS, GREEN, AND CO.

Just Published. SIXTH EDITION. *Revised and Enlarged. 8vo. Price* 15*s.*

The GAS and OIL ENGINE
By DUGALD CLERK,

Associate Member of the Institution of Civil Engineers, Fellow of the Chemical Society, Member of the Royal Institution, Fellow of the Institute of Patent Agents.

LONDON:
LONGMANS, GREEN, AND CO.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED
— *v* —
"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.
— *v.* —
"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT WHETHER
MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.
Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

THE "COOMBE" DRAUGHT SCREEN FOR INCANDESCENT BURNERS.
For Illustration and Statement of Advantages to be gained by its use, see "JOURNAL," Nov. 3, p. 830.
ALFRED ARCULUS & CO., Glass Manufacturers,
BIRMINGHAM.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,600	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne
W. H. PARKINSON,
FITTER.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street, NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
12, JOHN STREET, ADELPHI, LONDON, W.C.

The Cheapest House in the Trade for
LEVER LOCKS
FOR
GAS-METERS.

Joseph Oakley & Co.
Excelsior Works,
WILLENHALL.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 ,,
Ash . . . . . 2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

OSLER, BIRMINGHAM.

MANUFACTURERS OF GASELIERS IN GLASS AND METAL.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 34, Old Broad St., E.C.

THE DRUM
FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c.
See Advertisement in last and next issue.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

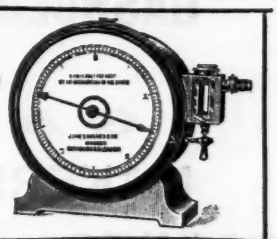
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

STOKERS' GLOVES.

GEO. BOULTON & SON, Wholesale Glove Manufacturers, 75, Goswell Rd., London, E.C.
Will be pleased to send Sample Patterns and Prices to the Managers and Engineers of Gas Companies, similar to those which have been supplied by them to most of the London Gas Companies for twenty-five years past.

ALL KINDS OF STOUT LEATHER GLOVES FOR FURNACE OR SMELTING WORKS MADE TO ORDER.

JAMES MILNE & SON, Ltd.,
GAS ENGINEERS,
MILTON HOUSE WORKS, EDINBURGH.
LONDON. — GLASGOW. — LEEDS.



SERVICE CLEANER.

HUTCHINSON BROTHERS,
GAS ENGINEERS, &c.,
MANUFACTURERS OF IMPROVED
WET AND DRY GAS-METERS.
STATION-METERS. LAMP-METERS.
TEST GASHOLDERS & GENERAL GAS APPARATUS.
BRASS MAIN & LAMP TAPS. UNIONS, FERRULES, &c.
The "Falcon" Lamplighter's Torch. Service Cleaners.
SYPHON AND OTHER PUMPS.
Wood and Wrought-Iron Purifier-Grids. Scrubber Boards.
WET AND DRY METERS REPAIRED.
FALCON WORKS, BARNSLEY.
Telegrams: "Hutchinson Bros., Barnsley."

LAMP SERVICE CLEANER.

MOBBERLEY & PERRY
STOURBRIDGE.
Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
Contractors for the erection of Retort-Benches complete.
London Agents:
BALE & HARDY, Gas Engineers and Contractors,
BRIDGE HOUSE 181, QUEEN VICTORIA STREET, E.C.

WILLEY & CO.

GAS ENGINEERS,

LONDON & EXETER.

Offices: HAVEN ROAD, EXETER.

MANUFACTURERS OF

GASHOLDERS, ROOFS, BRIDGES, GIRDERS,

AND EVERY DESCRIPTION OF

GAS APPARATUS.

MAKERS OF THE LIVESEY WASHER.

AGENTS FOR THE MAXIM CARBURETTOR.

Engineering Works: ST. THOMAS, EXETER.

Manufacturers of WET and DRY GAS-METERS of unsurpassed excellence.

Patent Penny-in-the-Slot AUTOMATIC METER with the latest improvements. Fraud Proof, Perfect in Action, Accurate in Registration, Instantaneous Price Adjustment *in situ* without Change Wheels.

Meter Factories: JAMES STREET, EXETER, and 248, KINGSLAND ROAD, LONDON, N.

Metropolitan Agent:

FRANK ACLAND, M.Inst.M.E., M.Inst.C.E., 70, Cheapside, E.C.

MANUFACTURERS OF

GAS-FITTINGS

IN ENDLESS VARIETY.

CHANDELIERS, BRACKETS, PENDANTS, MAIN COCKS, &c., &c., &c.

SPECIAL FITTINGS FOR THE AUTOMATIC BUSINESS.

Brass Foundries and Works: ST. THOMAS, EXETER.

Telegraphic Address: "WILLEY, EXETER." Telephone 132. Established over 30 Years.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Preston	1,500,000 ,,
Glasgow	300,000 ,,	Southport	750,000 ,,
Brussels	700,000 ,,	Bath	1,000,000 ,,
Liverpool	3,500,000 ,,	New York	1,200,000 ,,
Tottenham	750,000 ,,	Newburgh, N.Y.	350,000 ,,
Santiago	400,000 ,,	Tottenham (Second Contract)	750,000 ,,
Swansea	750,000 ,,	St. Joseph, Mo.	750,000 ,,
		Brussels (Second Contract)	700,000 ,,

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Stockport	500,000 Cub. Ft.
Shanghai	225,000 ,,	Norwich	1,000,000 ,,
Winchester	200,000 ,,	Guildford	350,000 ,,
Hoylake	125,000 ,,	Syracuse, N.Y.	850,000 ,,
Manchester	3,000,000 ,,	Bordentown, N.J.	125,000 ,,
Holyoke, Mass.	600,000 ,,	Lea Bridge	350,000 ,,
Edinburgh	2,000,000 ,,	Newburgh, N.Y. (Second Contract)	250,000 ,,
Stockton-on-Tees	500,000 ,,	Coventry	600,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. — **Telegrams: "EPISTOLARY, LONDON."** — *United States Office, 64, Broadway, New York.*

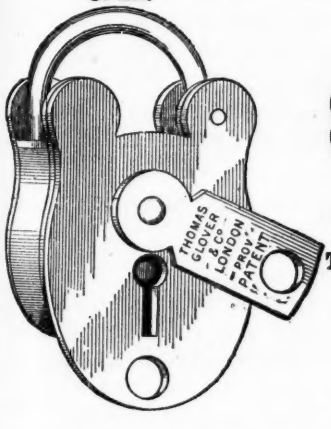
[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS:

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

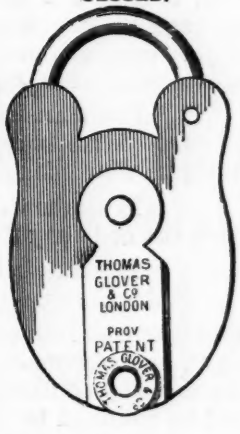
SECURE PADLOCK

Prevents Tampering with the

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

CLOSED.



Telegraphic Address: "GOTHIC LONDON." Telephone No. 8725.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL:	BIRMINGHAM:	MANCHESTER:
62, VICTORIA STREET.	1, OOZELLS STREET.	37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."	*Telegraphic Address: "GOTHIC."*	*Telegraphic Address: "GOTHIC."*

IMPROVEMENTS IN STREET LIGHTING.

Highest Efficiency with Greatest Economy.

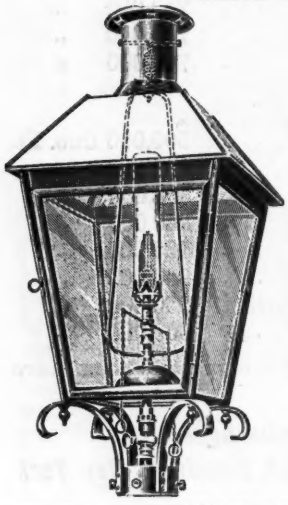
LIGHTING AUTHORITIES, GAS ENGINEERS, and GAS MANAGERS

are invited to inspect the

INCANDESCENT GAS-LIGHT

(Welsbach System),

which has now been successfully adapted to the purposes of

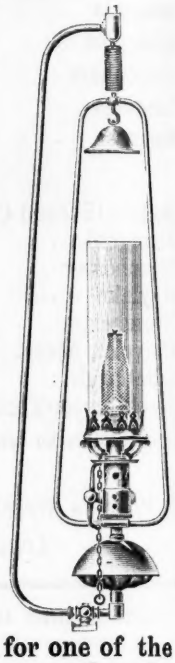


STREET LIGHTING,

the difficulties caused by VIBRATION having been OVERCOME by the use of the

NEW SPRING SUSPENSION FRAME (Patent).

This System of Lighting meets the requirements of all Lighting Authorities in those Districts where it is desired to effect an Improvement in Street Lighting WITHOUT INCREASE OF EXPENDITURE.



The following are Extracts from a PAPER read by Mr. F. G. DEXTER, before the SOUTHERN DISTRICT ASSOCIATION.

"The success of the experimental (Welsbach) lighting secured the contract for one of the Parish Council Districts; and this was shortly followed by the contract for three years for the city lamps. The total represents altogether about 500 single lamps, and 15 refuge lamps containing two lights."

"In the matter of maintenance of the street lights, the record is favourable—in fact, more so than the estimate provided. By the test-meter, the average daily consumption works out to 38 cubic feet per light, including bye-pass. The bye-pass consumes with a flame half an inch long, $\frac{1}{5}$ foot per hour. This represents 1000 cubic feet per lamp per annum. The average consumption per light, when in use, works out to 12,900 feet per annum, or about $3\frac{3}{5}$ feet per light per hour. The lighting is continued all the year round, from the average times of one hour after sunset to one hour before sunrise."

"The mantles have worked out to an average of three per lamp per annum; but, bearing in mind the absence of frost last winter, the writer believes that four mantles per light is more likely to represent average conditions."

"In the matter of cleaning, it may be said that the lanterns require less attention than with the ordinary flat-flame burner."

"The number of lights attended to per man averages 85."

"The 'Welsbach' Light is undoubtedly one of the greatest aids to successful competition that the Gas Industry has ever experienced. Its influence, while reducing the relative cost of light, has advanced the consumption of gas all over the country by the increased satisfaction of the existing consumers, and the attraction of others. The writer feels that its influence should not be confined to the house. It is capable of meeting every competitor in the street, from cheap oils to arc lights, in cost and in effect; and it is hoped that the foregoing experience may lead many others to seek its aid and to realize its efficiency."

FOR PRICES AND PARTICULARS, APPLY TO THE

INCANDESCENT GAS-LIGHT CO., Ltd.,

Palmer Street, Westminster, London.

Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

WEST'S GAS IMPROVEMENT COMPANY, LTD.,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER.

AND

104, Queen Victoria St.,

LONDON, E.C.

WEST'S

MANUAL

AND

POWER

MACHINERY

FOR

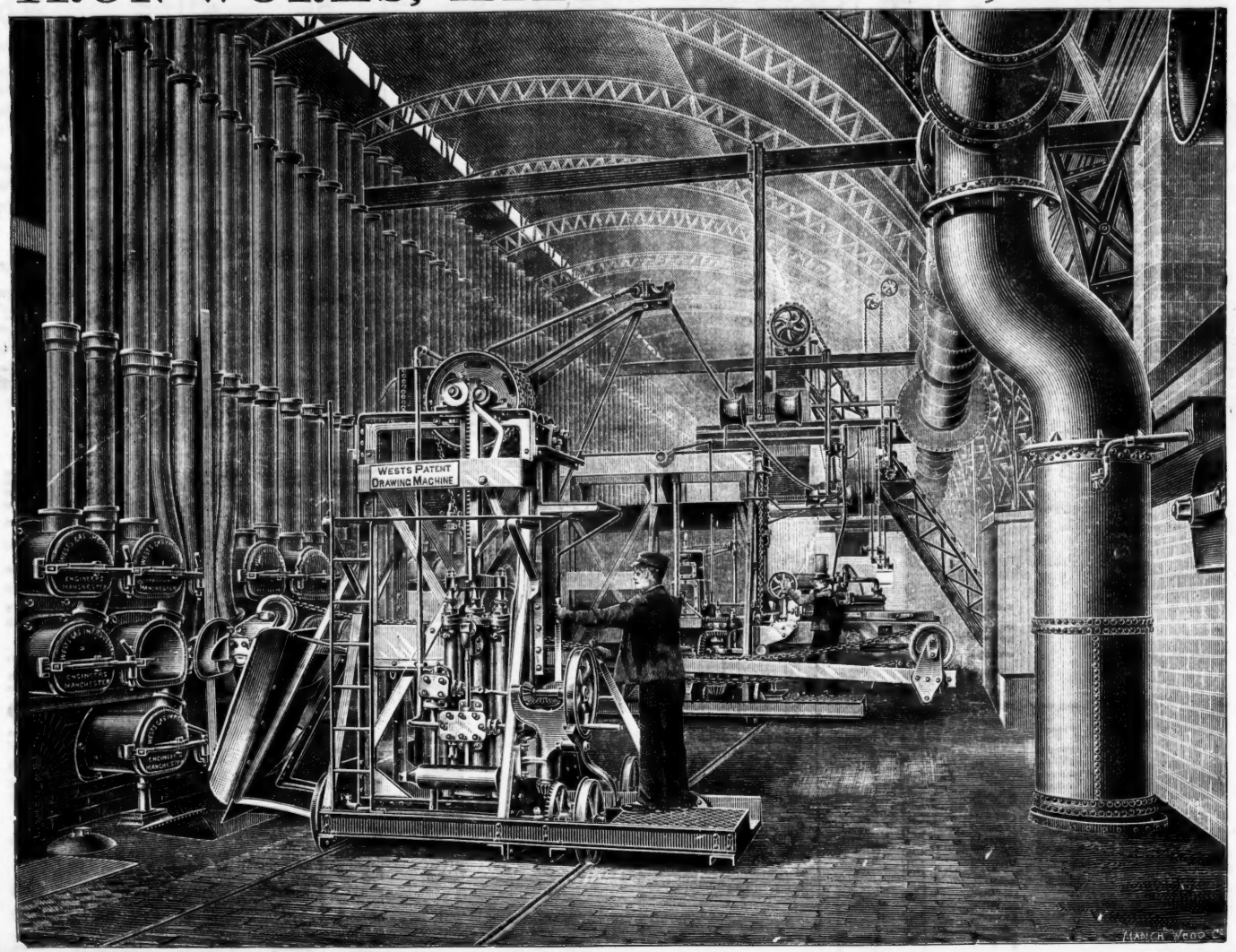
CHARGING

AND

DRAWING

GAS-

RETORTS.



Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

AND

104, Queen Victoria St.,

LONDON, E.C.

OVER

560,000

LINEAL

FEET

OF

RETORTS

DAILY

ARE CHARGED

AND DRAWN BY

WEST'S

MACHINES.

STOURBRIDGE
RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, Nov. 3, p. 880.]

OXIDE OF IRON.

NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

Wm. H. MÜLLER & CO.,

81, PALMERSTON BUILDINGS, LONDON, E.C.

TRADE MARK: "Compascum." Telegraphic Address: "FERRUM."

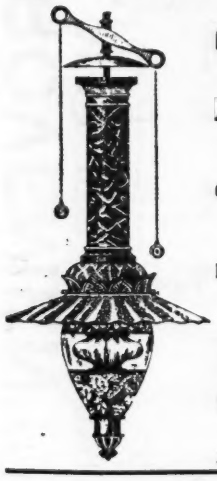
BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

Established 1860.

The Climax of Regenerative Gas Lighting!!



THE

"VERTMARCHE"

A 280-CANDLE POWER PLAIN IRON LAMP,

CLASS A— **55/-**

LIGHT for LIGHT less than half the price of any other Regenerative Lamp.

Manufactured in England.

HENRY GREENE & SONS,

153 & 155, CANNON STREET, LONDON BRIDGE, E.C.

Particulars and Prices Free. Agents Wanted.

JOSEPH CLIFF & SONS,

Incorporated in THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:

Baltic Wharf, Waterloo Bridge.

WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

LIVERPOOL:

16, Lightbody Street.

LEEDS:

Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas Works.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,

LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.

Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.

ESTABLISHED 1836.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS, Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

INCANDESCENT GAS LIGHTING

JENA CHIMNEYS.

We offer the well-known Chimneys manufactured by **Messrs. SCHOTT & GEN:, JENA,** at **56/6 per gross,** in original cases containing 3¾ gross.

Delivered free to any Railway Station in England. *Terms Cash.*

H. E. STENT & CO.,
10, North John Street,
LIVERPOOL.

BEST & LLOYD

MAKERS OF THE **BIRMINGHAM.**

PATENT "SURPRISE" PENDANT,

WITH PATENT SHADE.

The ONLY GAS-PENDANT suitable for Domestic Lighting; a room 18 ft. by 14 ft. being beautifully illuminated with one Incandescent Burner.

Extract from the JOURNAL OF GAS LIGHTING, Jan. 8, 1895.

"IN CONJUNCTION WITH

THE INCANDESCENT GAS-LIGHT,

it quite **supersedes** the familiar three-light pendant. We are able to bear witness to the **convenience** of the New Pendant."

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (FOUR APPARATUS).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

CHARGING OR COAL MEASURING TRUCKS.

FOUR CENTRE SIDE TIP WAGGON.

SPECIALITIES—

LYON & DEIGHTON'S PATENT SCOOP FILLING WAGGONS,

Steel Coal and Coke Barrows, Steel Charging or Coal Measuring Waggons, Railways, Points, and Crossings, Patent Turntables (requiring no Lubrication), Charging Scoops, Rake-Heads, Revolving Screens, Hoppers, &c., Cast-Iron Smith's Hearths, Steel Side Tipping Waggon, End Tip Waggons, or Universal Tip Waggons, Lyon's Patent "Cradle" Side, End, or Universal Tip Waggons for easily working heavy loads.

C. W. LYON, Engineer, Thornhill-Lees, Dewsbury.

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, Nov. 3, p. 831.]

PELOUZE & AUDOUIN'S

PATENT MECHANICAL CONDENSER.

Over 292,000,000 Cubic Feet of Gas per Day is passing through about 550 of these Machines.

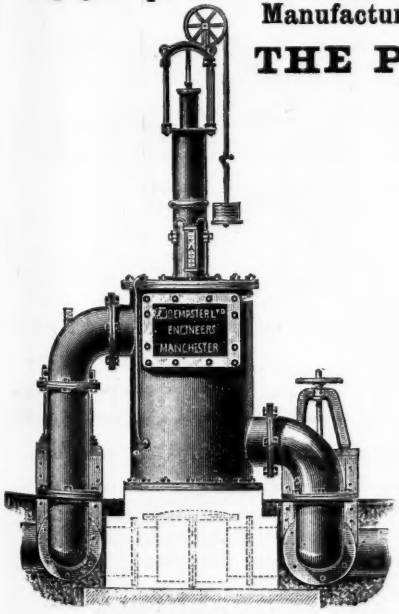
Messrs. R. & J. DEMPSTER, Limited,

HAVE PLEASURE IN ANNOUNCING THAT THEY HAVE MADE ARRANGEMENTS WITH THE

Compagnie pour la Fabrication des Compteurs et Materiel d'Usines a Gaz, of Paris, to Manufacture and Sell in this Country and the Colonies,

THE PELOUZE & AUDOUIN CONDENSER,

According to P. AUDOUIN'S LATEST PATENTS.



FRONT ELEVATION.

This Apparatus is in very general use in most of the Gas-Works on the Continent and in America; over **550** being in use in different parts of the World for condensing and arresting all Tar Particles and Vapours from the Gases from Coal, Oil, and Wood.

The large number in use is sufficient proof of its utility. By the almost complete elimination of Tar, which is effected to the extent of 99·7 per cent., it facilitates Purification in the Purifiers, by preventing the clogging or obstruction of the Purifying Materials, which, in consequence, last much longer; thus effecting a Saving both in Materials and Labour.

So effective is this Apparatus that a piece of white paper placed over a Test-Tap on the Inlet of the Machine is immediately covered with Tar, whilst on the Outlet the white paper remains perfectly clean.

The Machines are made in the following sizes, for Works producing per 24 hours—

	Cubic Feet.		Cubic Feet.
0	35,000	5	500,000
1	70,000	6	700,000
2	140,000	7	1,240,000
3	210,000	8	1,750,000
4	350,000	For larger Makes, two Machines are recommended.	

For Prices and further Particulars, apply to the Sole Makers—

Telegraphic Address: "SCRUBBER, MANCHESTER." **R. & J. Dempster, Ld.,** Gas Plant Works, Newton Heath, **Manchester.** Nat. Telephone Nos. 2296 & 54.

"HOLOPHANE" Ltd.

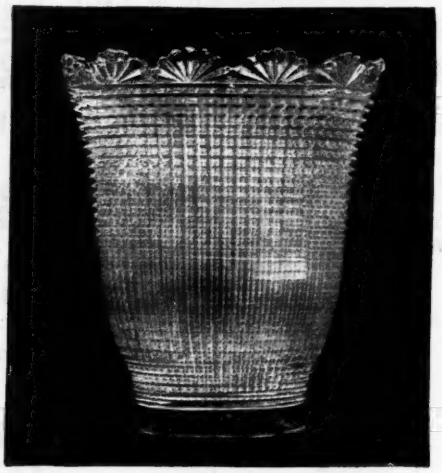
THE "HOLOPHANE" SYSTEM FOR GENERAL ILLUMINATION

(BLONDEL AND PSAROUDAKI'S PATENTS.)

APPLICABLE TO ALL FORMS OF LIGHT—

ARC and INCANDESCENT ELECTRIC, INCANDESCENT GAS, and OIL LAMPS.

1. A globe designed upon strictly scientific principles.
2. Grooved vertically inside in order to diffuse the light.
3. Grooved horizontally outside in order to distribute the light.
4. Throws the light in any required direction.
5. Softens all glare while increasing effective illumination.
6. **Gives double the illumination for the same money.**



No. 5.

7. Tested and proved by the Laboratoire Central d'Électricité, Paris.
8. Results confirmed by the Edison Electric Light Company, Paris, and Professor Vivian B. Lewes, London.
9. Shows a uniformly incandescent and brilliant surface.
10. **Mellows harsh centres of light, and destroys sharp shadows.**

Prices from 24s. per Dozen. Illustrated Lists and Terms on Application.

SHOW-ROOM AND OFFICES: 91, 93, & 95, QUEEN VICTORIA ST., LONDON, E.C.

CLAPHAM BROTHERS, LTD.,

— ESTABLISHED 1837 —

Wellington, Nelson, and Market Street Works,

KEIGHLEY, Yorks.

RETORT-FITTINGS,
CONDENSERS,
PURIFIERS, WITH PLANED JOINTS.

GASHOLDER TANKS,
COLUMNS, GIRDERS,
LAMP-POSTS,

And all Kinds of Gas-Making Apparatus and General Ironwork.

GAS and WATER VALVES and MAINS. ILLUSTRATED CATALOGUES ON APPLICATION.

ALSO SOLE MAKERS OF

Laycock & Claphams' Patent "ECLIPSE" WASHER-SCRUBBER,

Which is efficiently dealing with a total of **85,600,000** Cubic Feet of Gas per day.

Repeat Orders speak for themselves, some of which are given below—

		CAPACITY, CUB. FT.
Sheffield United Gas Company	2 Machines	1,500,000 each.
Do. do.	2 ,,	4,000,000 ,,
Halifax Corporation . . .	2 ,,	3,000,000 ,,
Keighley Corporation . .	2 ,,	1,000,000 ,,

		CAPACITY, CUB. FT.
Manchester Corporation. .	2 Machines	4,000,000 each.
Do. do. . . .	1 Machine	3,000,000
Rochester, Chatham, & Strood . . .		1,000,000
Do. do. . . .		1,500,000

CONTRACTORS TO HER MAJESTY'S GOVERNMENT.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Nov. 10, 1896.